Railway Age Gazette

Including the Railroad Gazette and the Railway Age

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE, BY THE RAILROAD GAZETTE (Inc.), 83 FULTON ST., NEW YORK.

CHICAGO: 417 South Dearborn St. CLEVELAND: New England Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico.....$5.00
Canada 6.00
Foreign Countries (excepting daily editions)..... 8.00
Single Copies .....15 cents each

Engineering and Maintenance of Way Edition and the four Maintenance of Way Convention Daily issues, North America, $1.00; foreign, $2.00.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

VOLUME 51. DECEMBER 15, 1911. NUMBER 24.

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THE editorial in the *Railway Age Gazette* of December 1, condemning the giving of presents by railway supply men to railway men concerned with purchases, evidently expressed what was in the minds of many persons, both supply men and railway men. We publish this week some letters on the subject, including a clear-cut expression from President Markham of the Illinois Central. The *New York Times* grew facetious editorially regarding our comments on this matter. It considers the giving and acceptance of presents by the sellers and buyers of supplies as so obviously immoral as to call for no explanation of why it is so, but merely for stern reprobation because it is so. We took the pains to point out wherein the abuse lies because it was impossible for us to believe that numerous business men have been deliberately doing what they have clearly recognized as both unbusinesslike and unethical. We felt, on the contrary, that many who have participated in this evil practice have done so without seriously considering what it involves. However, there is no question that, as the *New York Times* says, the practice is one which calls for the severest and most unreserved condemnation. If it is not actually grafting it is the vestibule to it; and, indeed, it is so like grafting that the two things are practically indistinguishable. As Mr. Markham says, there is none of the spirit of Christmas in it. It is simply an attempt to sugar-coat one form of the giving and taking of bribes—an attempt to commercialize, to prostitute and cash in, the Christmas spirit—and those who continue it after attention has been called to its real nature will put themselves in an absolutely indefensible position.

A DECISION of the Commerce Court in October in the cases of the Goodrich Transit Company and the White Star Line against the Interstate Commerce Commission has attracted little attention or comment, doubtless because of what appeared to be the narrow scope of the question at issue. Yet it may conceivably have far-reaching consequences. The petitioners, lake lines of steamers, protested against being required to reply to special inquiries of the commission issued under the authority of Section 20, and against the order that they should keep their books in accordance with accounting classifications prescribed by the commission. They conceded jurisdiction over that portion of their business which was performed under joint arrangement with rail lines, but denied the jurisdiction of the commission as to that part of it which was either port-to-port or intrastate in its charter. Judge Hunt sustained the contention of the water carriers, and his decision is doubtless good law. At the same time it serves to emphasize the absurdity of rate regulating statutes which exempt from jurisdiction so important a class of transportation agencies. But the main interest of the decision lies in its implications. The commission had maintained that "while no distinction has been made between petitioners' income and expenses in connection with its interstate business and intrastate business, such distinction was not made because while the income from the different kinds of business stated in the petition can with reasonable accuracy be ascertained, yet it is impossible to determine with any substantial degree of accuracy the expenses incurred in either of said kinds of business as separate and distinct from the others, and because it is essential that the commission know the total income derived by the petitioner from all its investments and sources, in order that the commission may determine what are reasonable and just rates to be charged by petitioner in its joint rail and water business, and to determine whether it is complying with the provisions regulating interstate commerce." But the court held that "the scope of the right to call for the report is conferred by the nature of the business to be set forth within the report when made." It makes no difference if state and interstate operations are commingled; that is the fault of the law. The court concedes that it may be "somewhat tedious work" to furnish information and follow a system of accounting along the

lines laid down by this decision, but ventures the statement, "Nor does it seem logical to say that, if the business is so far separable as to furnish a basis for a common arrangement as to part of it, that report and systematic account of such part cannot be had without report of the whole." Now, it may be beautifully logical to separate accounts as suggested, but it will be most sad and unlovely accounting, particularly if the doctrine should be—as it might properly be—applied to the intrastate and interstate business of the railways. With the present attitude of the railways toward the constant annoyances due to state interference in matters of accounts as well as operation, it is hardly likely that any one of them in the immediate future will carry any such proposition to the Commerce Court, but the mere contemplation of the effect of such a decision when applied to the accounts of rail carriers transports one into a realm of most interesting speculation.

THERE seems to be a general misunderstanding as to the action that was taken by the joint executive committee of the Master Car Builders' Association, the Master Mechanics' Association and the Railway Supply Manufacturers' Association regarding the entertainment features in connection with the conventions of the mechanical associations at Atlantic City next June. As reported in the *Railway Age Gazette* of October 27, it was decided, at the suggestion of the railway men, to make certain changes in the entertainment features and the manner of handling them. No specific action was taken except that it was decided to eliminate the formal features. The question of exactly what should be done was left in the hands of a committee consisting of the presidents of the three associations. It is quite probable that the formal receptions and balls will be replaced by informal dancing, either at the Marlborough-Blenheim or on the Steel Pier, and that something of this sort will be arranged for each evening during the conventions. The expenses of the social affairs will be divided between the three associations in such proportions that there can be no criticism that the railway men are entertained at the expense of the supplymen. This is a splendid move in the right direction. It is doubtful whether the cutting out of the formal features will be seriously regretted by very many, if any, of either the railway men or the supplymen, and the substitution of the less formal entertainments will undoubtedly add much to the enjoyment of the occasion. If some arrangement could be made to keep the exhibits open for inspection during the evening and early in the morning it would be appreciated by the railway men. Many of them cannot stay throughout the conventions and do not have nearly as much time to examine the exhibits as they would like. The value of the conventions and the standing of the mechanical department officers generally will be raised to the high plane on which they should rest by placing the conventions on a strictly businesslike and dignified basis. The entire programme, including all social affairs should be strictly under the direction of the railway men.

WHAT is a "tale-bearer?" An officer of the Lackawanna, addressing his employees at one of the meetings held on that road recently to give the "safety committee" a send-off, had some little difficulty in defining this term. Calling attention to the obvious fact that a large percentage of the deaths and injuries which occur among employees who are at work on and around trains are due to the acts or omissions of men who are habitually careless or thoughtless in some of the features of their work, he emphasized the duty of reporting the misconduct of such men; and yet, said this officer, "I don't want anyone to tell a tale about another." He wanted reports, but not tales. He recognized and respected the very common feeling, existing among all classes, that it is dishonorable to tell the superintendent anything about a fellow employee which will harm that employee. How to get out of this dilemma often seems impossible, and it would have been a good thing if that officer had offered a little further explanation of the ethics of the situation. The manager of the Lackawanna was asking for information which is necessary for the proper and decent conduct of the road's business. Suppose Tim Sullivan is in the habit of jumping on the front foot board of a moving locomotive coming towards him; he endangers his own life and sets a bad example to young yardmen. The superintendent ought to be informed. If you go to him because you like to make trouble for Tim you are a "tale-bearer." If you tell of the bad practice because you want to save Tim's life and promote the safety of the whole force you are doing a worthy service. It comes down, therefore, to a question of motive; and the only way to make sure that your motives shall be accepted as honorable is to have a reputation for honor in all things. Thus we have a clear and simple demonstration that in the railway service the humblest positions require the highest moral character. A reputation for honor cannot be acquired except by consistent uprightness, maintained for months or years. Secretiveness does not promote this object; frankness with fellow workers is a duty. Why should not the trainmaster foster this right spirit by encouraging men to tell him both the good and the bad that they see? To tell of good conduct will stimulate right courses of thought; as for bad conduct, it is the duty of the trainmaster to discover it, even to the extent of catechising the men. Why not? Why wait until you have to investigate a smash-up before inquiring about bad practices?

THE New York State Public Service Commission, first district, has ordered the Interborough Rapid Transit Company to post notices, giving suitable information to the public, whenever a blockade occurs on the subway lines, these notices to be displayed at the ticket office of every station affected within ten minutes after the blockade occurs. This is one more instance in which a railway officer is ordered by the public authorities to do a thing which he ought to have done without being told. We sympathize warmly with the railway superintendent who is hampered by the unbusinesslike requirements of state commissions; but not all of their requirements can be thus classed, and we also sympathize with the passenger who is annoyed by the slowness of the railway superintendent. To most of our readers an order to publish train delays within 10 minutes would, perhaps, be an unreasonable requirement, but in the case of the Interborough, carrying sometimes a million passengers a day, and sometimes a *thousand* on a single train, the public oftentimes has a right to know of a train detention in 5 minutes if it be possible to convey the information in that time. Some of the station platforms will become intolerably crowded in that time, and in less than 10 minutes dangerously packed. That is to say, the commission's 10-minute limit is at best only a rough estimate. The railway is bound, as before, to advise all passengers as quickly as possible. And the notice ought to be posted at the entrances to the station (at the head of the subway stairs) as well as at the ticket office. Fortunately, the telephone has at last crowded out the slower Morse telegraph completely enough to do away with all excuses for delay in transmission. Only by the slowness of the conductor in reporting or of the superintendent in circulating the report can passengers be deprived of such knowledge as they ought to have. The mileage of the New York subways is only about a hundredth of one per cent. of that of the railways to which we are addressing this little homily; but we do this because the lesson is applicable not alone in New York, but throughout our 240,000 miles of railway. With the telephone in use on innumerable railways, large and small; with despatching circuits on which conversation is easier over distances of a hundred miles than over the average city telephone line for 5 miles; and with portable telephones and "fish-pole" connections carried on trains, as is now the case on some roads, what is to hinder the adoption by all railways of the high standard which has been prescribed for the Interborough? One of the New York papers says that the employees of the Interborough "are trained never to know anything about the condition of the line." The

same slur has often been cast at steam roads. Assuming that there may be some justification for the closed-mouth rule, the simple way to obviate all trouble about it is for the superintendent himself to open his mouth very promptly, when necessary, and to have his words quickly spread by telephone. Why is it that the Erie is the only road that can boast of a conductor who was able to inform the despatcher's office within four minutes, when his train broke down two miles from a telegraph office?

FEDERAL WORKMEN'S COMPENSATION LEGISLATION.

WHEN, a few years ago, President Roosevelt made speeches advocating the enactment of a federal workmen's compensation law applicable to railways, probably most railway managers were opposed to the plan. The change that has taken place in their attitude toward public regulation is illustrated by the fact that a good many, if not most, of them are not now opposed to such legislation, provided it be fairly and wisely drafted. A federal Employers' Liability and Workmen's Compensation Commission has been studying this subject, and must by January 1, 1912, report to Congress what, if any, legislation it considers desirable. The commission is composed of Senator George Sutherland of Utah, chairman, Senator George E. Chamberlain of Washington, Representative William G. Brantley of Georgia, Representative Reuben O. Moon of Pennsylvania, W. C. Brown, president of the New York Central, and D. L. Cease, editor of the *Railroad Trainman*. Launcelot Packer is secretary. The commission a few weeks ago sent out a statement, in which it said that it had tentatively agreed to recommend legislation along the following lines:

(1) The law to provide for payment of compensation by interstate carriers engaged in interstate transportation to employees sustaining injury by accident while engaged in such transportation, except in cases of willful misconduct to be hereafter specified. (2) The compensation to be paid by the employer directly, and not out of a general fund created by any form of taxation. (3) That the law shall be in form compulsory, and not subject to election by either employer or employee. (4) The remedy provided by such law to be exclusive of any common law or other statutory remedy. (5) To apply to all accidents resulting to the employee while in the course of his employment, except those where the disability continues for a period of two weeks or less, the employer, however, to furnish medical and surgical assistance to an amount not exceeding $200. (6) Payments of compensation to be made under the law shall be made periodically, and not in lump sums, with, however, appropriate provision for commutation at any time after the lapse of six months on the application of either party. (7) The amount of payments to be limited to a minimum and maximum sum, and not to continue beyond a specified term of years, to be hereafter fixed. The question as to whether or not this limitation shall apply to permanent total disability is left open. (8) The amount of all payments to be based upon a percentage of the wages received by the injured employee at the time of his injury to be hereafter fixed. (9) All claims arising under the law shall be nonassignable and exempt from levy. (10) In case of death, payments to be made to dependents, including alien dependents. (11) All claims under the law to be made preferred lien. (12) Whenever any railway company and its employees have agreed or shall hereafter agree upon a plan of compensation which is as favorable to the employees as the provisions of this law, such plan may be substituted for the law, provided that wherever in any such plan the employees contribute to the compensation fund, the plan shall contain beneficial provisions in addition to the schedule of payments, equivalent to such contribution.

It is understood that the commission will soon report in completed form the bill it favors, and that it will stipulate what proportion the amounts paid in case of injury or death shall bear to the employee's wages.

There are two principal points involved in the question of workmen's compensation, that of expediency and that of constitutionality. As a broad proposition the *Railway Age Gazette* believes that legislation of this character is, under modern conditions, economically and socially just and desirable. The theories on which the old "fellow servant" and "assumption of risk" defenses are based is not consonant with modern industrial conditions. To say, for example, that a locomotive engineer, who has been injured in an accident because some despatcher whom he never saw has made a mistake in a train order sent from miles away, should not be compensated by his employer for his injury because the despatcher is a fellow employee and the engineer assumed the risk of working with such a negligent fellow, is nonsense. The fellow servant and assumption of risk defenses grew up under conditions of small industry. This is the day of large industry, and the laws ought to be made to fit the changed conditions.

Legislation which determines in advance how much the employer shall pay an employee, or his heirs if the employee be injured or killed, probably will not tend to increase accidents. Few men, indeed, will deliberately incur the risk of injury or death because they know in advance what the accident will cost their employer or be worth in money to them. When an employee is injured or killed the economic cost of the accident has to be borne either by the unfortunate man and his family, or by the employer, or by society. If the man's employment, even under the most favorable conditions and to the most careful employee, is an extra-hazardous one, as employment in some branches of railway service is, this is due to conditions which the individual employee did not create, and cannot control, and therefore, it is not equitable that he should not only suffer the accident, but that he or his family should also have to bear the entire economic cost of it. If the employer is to bear the economic cost, an arrangement under which the amount is fixed in advance that he shall, in any given circumstances, be obliged to pay, may be better for him than one under which he may have to defend himself by litigation against excessive claims, under which he may often have to pay such claims, and under which, in any event, he never can estimate with reasonable accuracy how much he will have to pay.

If, finally, the economic cost of accidents is ultimately to be met by society, it is better that it should be made a charge against the operating expenses of the particular concern or industry in connection with which the accident occurs, and then paid by society in the prices or the rates of the commodities or the services that society buys from that industry or concern, than that the injured person, or his family, or both, shall be cared for by public or private charity. Those who, in the performance of honest labor, are injured and become dependent through no serious fault of their own, but as a result of shortcomings of our industrial methods, are not fairly dealt with if allowed to become objects of charity; and furthermore, they can be cared for at less economic cost through the administration of proper workmen's compensation laws than by either public or private charity, whose administration is almost universally very expensive.

As between the employer and society—in this specific case as between the railway and society—while the compensation should come directly from the treasury of the employer, indirectly and ultimately it should come from the prices or rates charged for the commodities or services of the industry. How large an immediate burden the proposed legislation would put on the railways nobody, of course, can tell, even approximately, until a complete bill is drafted; and nobody can tell then more than approximately, for while elaborate statistics regarding the cost of past litigation and damages resulting from accidents to employees are being compiled, only experience with the proposed law will disclose how it will work. Furthermore, past experience is no guide to what future experience in the absence of workmen's compensation legislation would be; for the states are passing laws abolishing the "fellow servant," "assumption of risk" and "contributory negligence" defenses; and even where such laws have not been passed juries are showing a tendency to ignore the defenses mentioned and bring in increasingly large judgments against railways in damage suits brought because of injuries to employees. If the measure proposed seems reasonable it should not be opposed by the railways even though it may seem certain to cause even a very substantial increase in operating expenses.

The question as to just what kind of law ought to be passed is inextricably involved with the question of what sort of measure constitutionally can be passed. The differences of opinion

between the many able lawyers who appeared before the commission are so various and great that it would seem the wisest course to pass the best kind of measure which any considerable number of these lawyers believe will be upheld. The measure which would best answer this description would be one which would provide a reasonable scale of compensation, would abolish all the common law rights of action and defenses, and would be compulsory as to all interstate railway employers and employees, except such as may agree on some plan of compensation which, in the words of the commission's tentative draft, shall be "as favorable to the employees as the provisions of this law."

THE TRANSFER OF THE ONTARIO & WESTERN.

ASSUMING that the New York Public Service Commission assents, the transfer now of the Ontario & Western to the New York Central, after seven years of New Haven control, has in it some elements of mystery.

In November, 1904, following the failure of an attempt to secure a southward outlet and inlet for the Poughkeepsie Bridge system, the New York, New Haven & Hartford bought a little more than a majority of the stock of the New York, Ontario & Western. The last annual report of the New Haven shows that the control, omitting 22 preferred shares, was represented by 291,600 shares of common stock, which had cost the company $13,105,185, or about $45 a share. The purchase seven years ago was regarded as a hostile act by the New York Central, which began a survey across northwestern Connecticut for a shorter connection of its own with the Boston & Albany; but an appeal to the Connecticut legislature by the New Haven and an amendment of the general railway law of the state thwarted the scheme. The control of the Ontario & Western was welcomed in Boston and southern New England as a valuable acquisition; it was to give New England cheaper all-rail coal; it was to open northern Pennsylvania and western New York to New England factory products; and it was hoped that it forecast a larger western business beyond the Niagara frontier. Tested by earning power, the returns indicate that some of these hopes have been realized. Gross earnings of $7,090,888 in 1904-5 rose to $9,295,702 in 1910-11 and net from $1,281,276 in 1904-5 to $1,312,797 in 1909-10, though they fell to $1,142,936 last year, owing to increase of wages and loss of a western differential. But the purchase has paid continuously $2 a share to the controlling corporation, on a return of 4.44 per cent., and even last year the Ontario & Western lacked but $19,400 of earning its dividend, though revenue has considerably fallen since. In his last annual report, published in October, President Mellen emphasized strongly the future value of the line to the New Haven's New York, Westchester & Boston, with its Bronx terminal and "a more direct all-rail delivery of coal and general merchandise to all points reached." Yet now the control of the potentially important feeder is allowed to pass, and with it the direction of the coal traffic to New England; nor can any traffic agreements quite equal the value of positive and permanent control. On their face, the advantages seem very positively with the New York Central. It obtains control and traffic routings on a system comprising a total single trackage of 846 miles; some valuable coal properties; a new entrance into the anthracite field, whence the system last year carried 5.4 per cent. of the total anthracite output; a very important milk business, which last year brought in gross receipts of $742,104; and, what is of far larger importance, a new cross-country line from Oneida junction, in northwestern New York, to Weehawken. The New York Central's power of throwing much freight business, especially in times of intensive traffic, on the Ontario & Western is manifest and, in that aspect, while the acquired property cannot exactly be called a new trunk line with a terminal at New York City, the situation suggests it. Then, again, it is something for the purchaser to have secured the property against future transfer to rival interests.

The New Haven, which paid by 4 per cent. bonds for the Ontario & Western stock at about $45 a share, gains about $50,000 a year guaranteed under the transfer. But that net sum seems so trivial compared with the advantage acquired by the New York Central that one must look elsewhere for the New Haven's other offsets. One of them is to be found, undoubtedly, in the New Haven's purchase from the New York Central of the full control of the Rutland. This, with the Montreal connection annexed, presumably forms part of the New Haven's general campaign against the southern New England invasion by the Grand Trunk. It is also asserted that the Rutland reaches the great lakes by a route more efficient and economical than the Ontario & Western. And it appears certain that the New Haven will at least make an energetic attempt to develop, via the Rutland, new business both to Canada directly and to and from western points over the lakes.

The Ontario & Western sale, therefore, must be taken not separately, but as part of a more extensive and complex deal. The two-sided transaction as a whole has one other striking feature. It registers another step in that closer physical and financial New York Central-New Haven relation, which during the last few years has been so marked a feature in the relations of the two systems, and of which the joint Boston & Albany lease was a very recent sign. Is that movement to stop now or go on to more impressive results?

WHAT ARE THE RAILWAYS GOING TO DO ABOUT RAILS?

RAILWAY men continue to complain that they are not getting good rails. Some say that the rails they are receiving now are a little, although not much, better than those they were receiving a few years ago. Others positively declare that the steel now being put in track is not as good as that bought a few years ago. The consensus of expert opinion unquestionably is that if there has been any improvement since the agitation and negotiations about the rail question four years ago it has been very much less than it ought to be, and that most of the rails being made now fall far short of being such as safe operation requires.

If most of the mills are not turning out poor rails the detailed facts that will refute the numerous charges that they are ought, in justice to them, to be made public. If they are making poor rails the detailed facts ought to be made public in justice to the railways and the public. The individual railways possess the data necessary, if they would but give it out, to disclose the truth. They do, through the reports of the American Railway Engineering Association and other channels, give out some of the facts They do not give out all that it is necessary to know in order to draw correct inferences either as to the general character of the rails now being made, or, if it is bad, as to the reasons for this. As the safety of travel depends largely on the kind of rails made and laid, railway men and the public have a moral right to know all of the facts as to the results the different roads are getting and the reasons for them.

Why have the railway managers thus far failed and refused to tell all of the facts? One very important reason is that the makers of steel rails are large shippers and that each railway has feared that if it took the initiative in effectively agitating the subject it would be punished by the withdrawal of traffic. Another is that a good many of the same men are influential, as directors, large stockholders or bankers, in both the steel companies and the railways, and while they may never have directly interfered in the rail situation their connection with both buyers and sellers is almost beyond question having a decided influence in the wrong direction.

The trouble with rails is due to one of three causes. Either the railways' specifications are faulty, or the specifications are not being enforced by the railways and lived up to by the makers, or, while the specifications are adequate, the methods of manufacture are defective. Whatever is the trouble, the railway man-

agers have the means of remedying it—providing there is no interference from those higher in authority than the managers. They can begin by making public the results that they get from the steel bought from the different mills, mentioning the mills not by numbers, by which only a few persons can identify them, but by name, so that all persons may know which are making good, and which poor, rails. Then, as another step, they can quit giving orders to mills whose product is poor and concentrate them on those whose product is satisfactory. The tariff on rails was halved by the Payne-Aldrich law, and those unfamiliar with all the pertinent conditions might inquire why the roads do not try the effect of placing some orders abroad. There seem to be two reasons. One is, that the management of each road fears that if it ordered rails abroad the steel companies might tell it to go abroad to get its traffic. The other reason, unless our information is entirely incorrect, is that there is an understanding between the rail makers of the United States and those of foreign countries, in consequence of which the foreign makers refuse to sell rails to the railways of this country. They may not do so in express terms, but they ask prices, or impose conditions, which come to the same thing.

One of the main points that has been in controversy between the railways and the manufacturers has been as to the price that ought to be paid for improved rails. The makers have said that they must get more money for better rails, and many of the railways have said that they could not afford to pay more. One good way to settle whether better rails can be made for present prices would be to have a committee of experts, appointed by both parties and given unreserved access to all pertinent information, investigate and report on the subject. While the question of what price shall be paid is one for determination by negotiation between the makers and the railways, the question of safety involved is one with which the public and the railways are primarily concerned. The public interest requires that the roads shall get safe rails, if they be obtainable, whether they get them at present, at lower or at higher prices, and if the railway managements would show a little more of the courage, a little more of the backbone, a little more of the spirit of co-operation among themselves, that their duty to the roads and the public demands, the problem would in due course be solved. If the makers can wield a big stick in the form of tonnage, the public can also wield one in the form of more drastic regulation; and if some day the public should get the idea into its head that one of the main difficulties in the way of the solution of the rail problem is that the same men are very influential in some steel companies and many railways, it might so wield its big stick as to cause serious results for both the makers and the roads.

THE USEFULNESS OF A PHYSICAL VALUATION.

THE Hadley commission recommends that the Interstate Commerce Commission be given authority and the necessary appropriation to make a physical valuation of railways whenever, in the opinion of the Interstate Commerce Commission, this will help it to pass on any of the questions brought before it. Physical valuation—in other words, the estimated cost of reproducing a railway's physical property—is the main factor in determining the fair value of railways, and its fair value is the main factor to be considered in the determination of the reasonableness of an entire system of rates. If the railways are to base their opposition to reductions of rates on the constitutional ground that they must be allowed a fair return on the fair value of their property, the Interstate Commerce Commission, in order to ascertain if a proposed reduction would deprive them of such a return, unquestionably should have the authority and the means of finding out what the value of the property is. The opposition to a physical valuation by railway officers, and the demand for it by shippers and many public men who consider it necessary for the protection of the public, have been based very largely on a misapprehension as to the use that could and would be made of the results of such a valuation.

The *Railway Age Gazette* has taken the position that as a means merely of satisfying curiosity as to whether or not, at any particular time, the outstanding par value of railway securities approximated the cost of reproducing the property, a physical valuation could do no harm to railways that in all probability it would show that the property value was higher than the par value of outstanding securities. If the public is willing to pay the cost of gratifying its curiosity it surely is entitled to do so.

The Securities Commission's report, however, goes to the root of the whole matter in showing the absurdity of trying to discover any rigid relation between the par value of securities issued against the property and its value at any given time. A readjustment of the par value of securities outstanding to the present value of railway property "would become archaic almost from the outset because an adjustment of securities based on the values of today might be totally erroneous tomorrow."

The Interstate Commerce Commission's comments on physical valuation seem to indicate that it thinks a physical valuation would be of some use in determining whether railway rates and profits in general are too high and might be made a new starting point from which, by the employment of a theoretically perfect system of accounting, it could determine at any future time what the value of a railway's property was, and whether its profits were insufficient, fair or excessive. The Securities Commission's report cannot prevent the Interstate Commerce Commission from using a valuation in this way, but it shows that, in its own opinion, such use of it would be injudicious. Throughout the report the principle is held that the profits of wise and far-sighted investment and management should accrue to investors, and that likewise the losses due to unwise investment and management should fall on investors. "No attempt," says the Securities Commission, "should be made by statute to limit railway profits to a fixed percentage, or to treat a high cash dividend as necessarily indicating extortion. Railway charges must be reasonable; but to try to control rates by arbitrarily limiting profits is to put the manager who makes his profits by efficiency and economy on the same level as the one who tries to accomplish the same result through extortionate charges."

Let us say that today two properties are each found to be worth $10,000,000. Under the accounting rules of the Interstate Commerce Commission, each road spends $1,000,000 a year for the next three years for additions and betterments. One road's management applies its money on grade reduction, the other on heavier motive power. At the end of three years the road that has cut down its grades is able to conduct its business at an operating ratio of 55, as compared with an operating ratio three years previously of 65. On the other hand, the road which has bought heavier motive power finds that it has made a mistake; that the character of its traffic and of its roadbed is such that the heavier motive power cannot be used to anywhere near its full capacity, while it is far more expensive to maintain. This second road's operating ratio has risen from 65 to 70 per cent. The second road asks to raise its rates on certain non-competitive traffic. Is the commission to say that the value on which it now has a right under the constitution to earn a fair return is $13,000,000? The values of the first road and of the second road are not the same at the end of three years. The par value of outstanding securities may be exactly the same. The same amount of money may have been spent on the property, but the heirs of a business man who would pay the same price for the two properties if they were to be offered to him free of all incumbrances could properly apply for a guardian to keep him from throwing away his money.

If the question of raising rates on the second road comes up at the end of the three year period, or of lowering rates on the first road, the Securities Commission recommends that the Interstate Commerce Commission be given the right to make a valuation of the two properties, and such a valuation, if properly made, would show that the second road could not, under the constitution, claim as high a rate of return on its outstanding securities as the first road, and that the first road could not be

restricted to as low a return as the second road, simply because the securities of the second road do not at the end of the three year period represent as valuable a property as do those of the first road.

The Securities Commission believes that the giving to the Interstate Commerce Commission of the power to make a valuation may be found sufficient to protect the public without the passing of a law that should require approval by it in advance of the amount and the purpose of stock and bond issues.

THE SECURITIES COMMISSION REPORT.

A UNANIMOUS report on an important question of public economic policy, heavily concurred in by President Taft, and made by a commission of five men, including a great economist, a member of a great private banking firm, an interstate commerce commissioner, a member of the President's cabinet and an able lawyer who is the author of a book on interstate commerce that has established his reputation as an authority on that subject, is worthy of the most careful study and consideration by those connected with the industry directly concerned, by Congress and by the public. If the report of the Hadley commission on the regulation of railway securities has not settled the question of the advisability of a physical valuation of railways, and does not show what can and what cannot be done to prevent the evils resulting from overcapitalization, it is because there is something behind these questions which the experience and the best thought of the host of successful men who gave their opinions freely to the commission and of the commissioners themselves, could not suggest.

The fundamental principle on which the entire report was founded is suggested by the sentence, "It is far easier to pass a radical measure which is going to be evaded than to secure obedience to a conservative one."

The commission comes to the conclusion that it is the degree of publicity given to the facts regarding security issues, rather than the stringency of the law regulating them, which will give the public the most and best real protection. "A stringent law inadequately enforced and secretly evaded is the worst thing that can possibly be offered the public, because it gives color to claims which have no foundation in fact." The extraordinarily exhaustive fund of information and opinion which the commission had at its disposal makes almost conclusive its opinions as to the *possibility* of remedying the real and imaginary grievances which have led to the criticism of railway financing and rate-making. The commission finds that the extent to which a law regarding security issues, however well drawn, can protect either the investor or the shipper is quite limited. "One man expects that a good law on stocks and bonds will be great service in enabling courts and commissions to protect shippers against overcharge; a second believes that both investors and shippers can be benefited by an abolition of the profits of the promoter; a third, that securities can be standardized so that the investors will be sure of getting the returns which are promised them; a fourth demands that the public confidence be so restored that the community may get the railway capital it requires. The attainment of these results is beyond the power of an act of Congress. The chief thing that such an act can do is to remove obstacles which bad laws and worse practices have placed in our way."

It is on this finding, which should be accepted as axiomatic, that a judgment of the Securities Commission's work should be based. Its report is so carefully worded and so closely reasoned that it cannot be adequately summarized. On another page an attempt has been made to give a list of the specific recommendations made, and in another column is discussed the commission's recommendations on physical valuation. It has added to its report a number of suggestions indicating points relating to publicity on which amendments to the Act to Regulate Commerce might be based. These suggestions are not, however, formal drafts of a bill.

If the suggestions and spirit of the commission's report can be so placed before the people that they will understand the true principals involved, it will in itself go far towards satisfactorily solving a great number of problems that have confronted the investor, the railway manager and the public in its relations with railways.

As to the specific recommendations in regard to publicity, we do not believe that they are either definite enough or go far enough. The commission says: "We are told that if it was possible to standardize food by a pure food law, it ought to be possible to standardize railway securities by a securities law. It is possible—to the same extent and no more. The pure food law enables a man to know what he is buying; it does not certify that the thing he buys is good for him." The pure food law goes further than to *enable* a man to know what he is buying; it comes as near as now seems practicable to *force* the information on him. The maker of a patent medicine is not required to file with the board of health a formula showing that his product contains 60 per cent. of alcohol and some morphine. He has to put these facts on the bottle itself in letters of a certain size. It's all very well to say that if a man is so stupid as not to be able to take care of himself the law ought not to do more than enable him to protect himself. But, regardless of the ultimate economic right or wrong of the principle, what the people now want is to be protected against their own mistakes, and a railway company which is simply required to file with the Interstate Commerce Commission a statement of the purpose of a stock or bond issue and the other information which the Securities Commission believes the public has a right to possess protects only the investor and that part of the public who are wise enough to protect themselves. It seems as if the commission, having gone so far in its analysis of conditions, could have capped and rounded out its work by recommending a specific law which would require the publication in some manner, on the date of the sale to bankers of a railway's securities, of a full prospectus showing the use to which the proceeds of the sale are to be put, the interest of the directors in any financial operations effected by such sale, the price which the company was compelled to pay for its money, and the other facts recommended to be filed with the Interstate Commerce Commission. Then not only would the public be enabled to find out the facts, but the facts would be thrust before them. For the accuracy of these facts the directors should be held civilly and criminally liable.

THICK AND THIN FIRING OF LOCOMOTIVES.

A FUEL test with a passenger train of 10 cars weighing 560 tons was recently made on the Lehigh Valley from Buffalo, N. Y., to Jersey City, N. J., 446.6 miles, by running one locomotive through without change. The time on the road was 12 hours, the amount of bituminous coal burned 15 tons, and the average steam pressure 195 lbs. The interesting feature of the performance was not so much the endurance of the machinery without adjustment or repair, as the small amount of coal burned and the manner in which the fire was handled. The amount of coal usually burned on the same run when several engines are used is 25 tons. The report of the tests states that the fire was not cleaned or raked, and the grates were shaked slightly and only six times. It is this manner of handling the fire to which we call particular attention, as it is a radical change from the ordinary practice; one which results in marked economy in fuel and is growing in favor on some of the largest railway systems.

The method of firing locomotives with little disturbance of the coal bed on the grate, either by shaking or slicing, or by the use of the poker or rake, has been used on some railways in the South for a number of years, and it first came into prominence at the first convention of the International Railway Fuel Association at Chicago in June, 1909. A paper was then read by T. E. Adams, superintendent of motive power of the

St. Louis Southwestern, on How to Successfully Burn Locomotive Fuel, in which he said: "The clinkering of coal is due to the manner in which it is handled and not to the quality of the coal. If a proper depth of coal is established on the grate when the fire is new it will not clinker, and to prevent clinkering on the run the grate should not be shaked when the fire is light. After a long run, when ashes accumulate, it may be shaked down to a depth of 8 or 10 in., the ash pan cleaned and the engine continued in service. The condition of the fire will then be better than if it had all been dumped and a new fire made." Mr. Adams regards it fundamental in the art of firing locomotives that when the steam pressure drops, the coal is not distributed properly over the grate, or the bed is too shallow for large steam production. The method here advocated may be termed "thick firing," where a bed of ashes is allowed to accumulate on the grate, as distinguished from "thin firing," where the grate is shaked to keep the fire free from ash and bright live coals cover the grate surface. It is claimed that the shaking of the grates and the use of the slice bar are the most potent causes of clinker and of burned grates and warped ash pans, as the intense heat next the grate surface fuses the ash and envelops a portion of the coal in the form of clinker. This is shaked into the ash pan and, with live coal dropped by the further shaking of a thin fire, a bank of live coal is formed in the pan which heats it red hot in spots and causes it to warp.

It is even claimed by the most radical of the thick fire advocates that the clinkering of coal is due to the manner of handling rather than to the quality of the coal, and this has done much to discredit a method of firing which undoubtedly has much merit. Clinker is caused by the fusion of the ash and other foreign substances like iron pyrites; the degree of clinkering is dependent on the temperature of the fire. There is, however, a greater variation in the fusibility of ash and other foreign matter associated with coal than there is in the temperature of the fire. For this reason the formation of clinker is dependent on the character of the ash as well as the method of firing, and, therefore, to some extent, on the quality of the coal. Most locomotive coals are comparatively free from sulphur; they produce a light ash and can easily be burned with little shaking of the grates. With this grade of fuel there is large opportunity for reform in the matter of firing and for substantial economy in the amount burned. There are other coals which will clinker in spite of the most careful and intelligent firing, and it should not be claimed that thick firing will prevent clinker with all coals. The avoidance of clinker on locomotive grates has much to do with successful firing, for clinker is the principal reason for the shaking of grates and the cleaning of fires, and it is the direct cause of a large loss of good fuel which is carried down to the ash pan with the clinker and the violent disturbance of the fire bed.

In discussing efficiency in locomotive coal consumption at the second convention of the Fuel Association, a traveling engineer of large experience said: "There are more grates burned out, more coal wasted on account of green coal passing to the ash pan, and more ash pans burned and warped from excessive shaking of grates than from any other cause. The practice should be restricted and the rule adopted to shake grates as little as possible, consistent with the maintenance of regular boiler pressure and steam making capacity. It is understood that as the ashes accumulate on the grate the depth of the fire increases and there is an advantage in having this layer of ash on the grate, as it prevents the leakage of good coal, warms to some extent the air passing through it, and perhaps helps to distribute it more evenly. It also prevents the excessive passage of air into the firebox where there are holes in the fire and the coal bed is too thin. The excess air cools the furnace and rapidly reduces the rate of steam production. The strong blast of the exhaust is for the time sufficient to supply the proper amount of air for combustion, and it causes sufficient stirring of the fire to allow the lighter portion of the ash to pass out through the tubes and up the stack. In this way a fire may be maintained for a long run without shaking the grates or causing such a deep accumulation of coarser ash as would prevent the admission of sufficient air to the fire.

In his book on Locomotive Performance, Professor Goss gives the following conclusions as to the effect of thick firing on boiler performance: "It is probably true that an experienced fireman can judge with accuracy when his fire is in condition to make the boiler do its best, but the man must be one of exceptional ability and skill. A fire may be maintained so thick as to greatly impair the efficiency of the boiler on account of insufficient air supply. Between the limits of a very thin and a very thick fire there is for every condition of draft a corresponding thickness of fire which will give maximum efficiency. Variations in boiler performance under conditions which are identical emphasize the importance of the fireman's judgment and skill as factors affecting the efficiency of a locomotive boiler."

It is difficult to say how thick a fire should be, as it depends on the quality of the coal, the grate area and the intensity of the blast, but when the engine is working hard the draft is strong enough to force air through a bed of coal more than a foot deep. In a paper on Bank vs. Level Firing, by E. D. Nelson, in the Master Mechanics' Proceedings, 1909, page 103, the level fire is shown to be 8 in. deep, while the wide bank at the back half of the box is 20 in. deep. With this thick banked fire the capacity of the boiler and the rate of evaporation were as high as with the level fire, so that the steam-making qualities were not affected until the bank was made 28 in. deep, and even then the boiler horsepower developed was 1,032, compared with 1,081 obtained with the level fire. In this paper Mr. Nelson calls attention to the effect of the fireman's work on boiler performance and fuel economy. In one test with a banked fire the evaporation was 6.89 lbs., while on the next test with the same fireman an evaporation of 7.99 lbs. was obtained, resulting in a saving of 960 lbs. of coal on a 2-hour run, which is equivalent to a saving of 2,800 lbs. over a 100-mile division.

The principal objection usually made to a thick fire is that it prevents the admission of sufficient air for complete combustion, but the best action of the furnace is indicated by the free production of steam, and so long as sufficient steam is made, the limit of thickness of the fire has not been reached. The reports in the proceedings of the Fuel Association, showing runs of 150 to 200 miles without cleaning the fire or ash pan and with very little shaking of grates, are doubled by many because they imagine that most of the ash must remain on the grate or in the ash pan, but a simple calculation will help to explain. Suppose ten tons of coal are burned which contain 10 per cent. ash. The amount of sparks and cinder thrown from the stack may easily be 10 per cent., or 2,000 lbs., and half of this, or 1,000 lbs., may be one-half ash and non-combustible matter and one-half good coal. Another 10 per cent., or 2,000 lbs., of a mixture of ash and carbon may become dead on the grate and ordinarily be shaked through into the ash pan. If it is only partially shaked and, say, 1,000 lbs. remains on the grate and 1,000 lbs. goes into the ash pan, there will not be sufficient dead ash on a fair-sized grate to obstruct the proper admission of air. If the grate is not shaked, or only slightly, a large part of the 1,000 lbs. of fine, light ash, which is usually thought to accumulate on its surface, will be drawn through the tubes and out the stack by the strong blast; only the coarser and heavier portion will remain on the grate, and this will not clog the fire so as to prevent free combustion.

Thick firing obtained by restricted grate shaking thus results in less clinker, less loss of green coal through the grate, less cooling of the furnace due to excess air through thin fires, less burning of grates and less warping of ash pans, with equivalent or better boiler capacity and economy. While many regard the principle as doubtful or unsound, the fact remains that the practice of thick firing has extended to a number of Northern railways, and it is now well established on one of the largest lines in the Northwest, where ordinary Illinois and Iowa coal is used.

Letters to the Editor.

"ABOLISH THE PRESENT GIVING."

Chicago, December 6, 1911.

To the Editor of the Railway Age Gazette:

I desire to compliment the *Railway Age Gazette* on the editorial in its issue of December 1 relative to the holiday gift-making practice.

My connection with the Illinois Central only dates from January 12 last, and I have no personal knowledge as to the extent to which the practice obtains, but I think it should be plain to every one that there is none of the spirit of Christmas-giving attached to the gift from a representative of a selling concern to an employee of the buyer, and that the acceptance of presents from those to whom no legitimate service has been rendered creates an obligation on the part of the recipient to which he should not permit himself to be subjected.

It is unquestionably to the interests of both the seller and the purchaser that the practice of making gifts for the purpose of controlling business should be discontinued, and I am very strongly of the opinion that the publicity given to it by the *Railway Age Gazette* will be of benefit to all concerned.

C. H. MARKHAM,
President, Illinois Central.

December 11, 1911.

To the Editor of the Railway Age Gazette:

I write you to commend the sentiments in your editorial on the giving of presents to railway men. I am sure many other supply manufacturers heartily concur in these sentiments, and feel sure that this timely article will go a long way towards abolishing the practice.

SUPPLY MANUFACTURER.

Chicago, December 7, 1911.

To the Editor of the Railway Age Gazette:

The writer of the editorial on present giving in your issue of December 1 has made one mistake; he should have presented this earlier, so that the resultant good effects would have been more numerous. This is a question of some moment and its treatment is an illustration of courageously protesting against a custom that is all wrong. A multitude of criticisms will be the share of the one who has started the protest. There are already expressions from those of opposite views, because there are men who like to make presents to railway officers and thus become "good fellows"; there are officers who like to receive presents.

We all do. We are human enough for that; but at the same time it must be evident that the only value of the gift is intrinsic. There is nothing sentimental in it, nor does it carry any other remembrances than those of paint, oil, freight cars, iron and steel, or other bulky commodities not usually associated with grandfather clocks, haviland China and oil paintings. We are all in the game for the most there is in it, but this most should come only through the employing company.

Every human being thinks that what he does is right, or near right. It is ridiculous to assume that no influence has been felt by any of the numerous railway men to whom presents have been given. One supply representative sends an expensive present. A competitor does not. In our own case we always feel, being charitable to ourselves, that nothing would change our former condition of impartiality. But how about the men who are influenced? From the supply men's presents the expectations grow until, perchance, some transactions have taken place which mean ultimate entanglements.

It is a safe bet that every railway head has read this article, and also that he has thought of it to a considerable extent. It is most certain that it has caused general precautionary instructions to be handed down to department heads, for the first time, broadly speaking, in the history of American railways.

As a prophecy, the custom will quickly cease, as the reform, once started, must gather more and more supporters. It is a practice too inconsistent to stand and must, of necessity, quietly cease to exist.

MECHANICAL DEPARTMENT OFFICER.

Chicago, December 5, 1911.

To the Editor of the Railway Age Gazette:

I certainly take my hat off to you and commend your courage, backed by the strength of your convictions, on the stand taken in the editorial on "present giving," which appeared in the *Railway Age Gazette* of December 1. This custom is eating into the very life of business honesty.

The supply business in relation to the railways is not what it should be, by any means. In fact, power is wielded by some in such a manner as compels the purchaser to throw business in certain directions in the face of lower prices and far better equipment offered. The inducement offerings, in whatever form, whether money or gifts, run as long as the recipient is in a position to reciprocate, but when the recipient is "on the outs" the cupboard is empty to him, and the gifts cease, showing conclusively that it is not from a desire to be loving that the presents are made.

Is it any wonder that the government is and has been investigating and turning the "lime light" on the methods of business of the present day, not applicable only to the supply trade, but to all lines of business? And we have only ourselves to blame.

No one knows better than the supply salesman, of the deep-rootedness of the present day evil, as it is he who has to meet conditions, and if his concern is not strong financially, even though its goods are far superior to those of the larger concerns, being unable to meet "competition" (so styled), he is left out. By this method of getting a "pull" his concern feels the arm of the "octopus" while the other arm of this monster reaches into the pocket of the innocent stockholder of the railway, who gets, and perhaps doesn't, the meager dividend upon his holdings, while the third arm of this monster lets loose its ill-gotten gains into the coffers of some official who has had the "say"; and we hear of "So-and-So" resigning, rich (upon a meager salary), and the smiles play over the faces of the supply representatives, who, perhaps, are discussing events in the smoker of the Pullman.

The railway journals are filled with information bearing upon the fearful increased cost of maintenence of rolling stock, but really offer no remedy, and some go so far as to show cuts of cars, damaged from one or another cause. Analysis indicates:

First. Thousands of "old timers" in freight equipment cars are being operated in modern trains, between all-steel "battleships"; consequently maintenance cost runs up.

Second. The old standards of construction are being incorporated into the construction of steel equipment; a wooden sill is being changed to steel, a brace from wood to steel, etc.; and as the steel equipment is only in experimental stages, is it a wonder that maintenance cost runs up? Then, again, the demands upon the railways by the government, are really responsible for a major portion of the increased cost of maintenance, for, to change from wooden to steel equipment, time should be taken in which to prove out the value of certain lines of construction. Hence, we are certainly learning at fearful cost that the mere changing, under old lines of wooden construction methods, practically adopted in steel construction, does not prove that we have solved the problem by any means. Better that we had slowly and surely changed step by step from wooden equipment to combination wooden and steel with non-telescoping ends; then, under tested mechanical designs, finally to all steel.

Third. The use, through "pull," of certain mechanical and expensive devices, would seem, from a careful examination of maintenance cost of repairs and renewals, to be another and vital cause of the increased cost of maintenance of rolling stock.

We cannot shut our eyes to the fact that a major portion of increased cost of maintenance of rolling stock is not the direct result of "graft." Anyone familiar with details of construction, and a thorough mechanic, walking through our repair and yard terminals, can easily solve the problem.

Why is it that when a certain specialty is found to be an expensive outlay, its continuance is sanctioned? Why is it that flagrant and barefaced "pull" is allowed to take the justly due dividend from the stockholder? How can some, under meager salaries, who have the "say," retire, under fire, rich?. The above questions may be answered thus: The little toad in the puddle follows the lead of the larger ones. If he gets too inquisitive the larger one simply swallows up the little one, and the unthinking stockholder and easy public pay the bills.

The handwriting of publicity is already on the wall. The wrecks are already strewn along the shore, and through the columns of your excellent journal, the lime light of investigation will throw consternation among the gang, and after the storm has blown over, the little fellow can sell his products in competition with the larger, and the "pull" will not be an eyesore to the honest business man. Repair costs will be brought down to a minimum and the stockholder will receive his justly due dividends. The salesman will not besmirch his reputation, high, important positions will not be used for petty gain, and expense accounts will not be padded to cover gifts because we happen to love our dear brother who has the "say."

RAILWAY SUPPLY MAN.

CHICAGO, December 9, 1911.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The editorial in your issue of December 1 regarding the wholesale distribution of Christmas gifts by representatives of railway supply houses is most timely. The practice has grown to proportions where it has become an abuse. There is no good and valid excuse for its existence, and its abolition should be earnestly desired by all right-thinking men.

The spirit of the Christmas festival, which forms the excuse for this promiscuous giving by those who sell to those who buy, is commercialized and cheapened by the practice. No thought of the fundamental idea underlying the observance of the Christmas holiday enters into the transaction. The finer character of both the men who give and those who receive is lowered, and the keenness of their moral perceptions is dulled and blunted in the process. If the expression of a kindly thought or a grateful remembrance was the underlying motive, a simple Christmas card would serve better to convey it than the most elaborate and costly gift, with its burden of unearned obligation.

The situation of the recipient is in most cases more difficult than that of the donor. No one likes to be accused of "leaning over backwards" in his uprightness, or of ostentatiously attempting to occupy a higher moral plane than his neighbor; nor does any man wish to be considered discourteous to his fellows, and the refusal or return of a proffered gift is often regarded as the height of discourtesy.

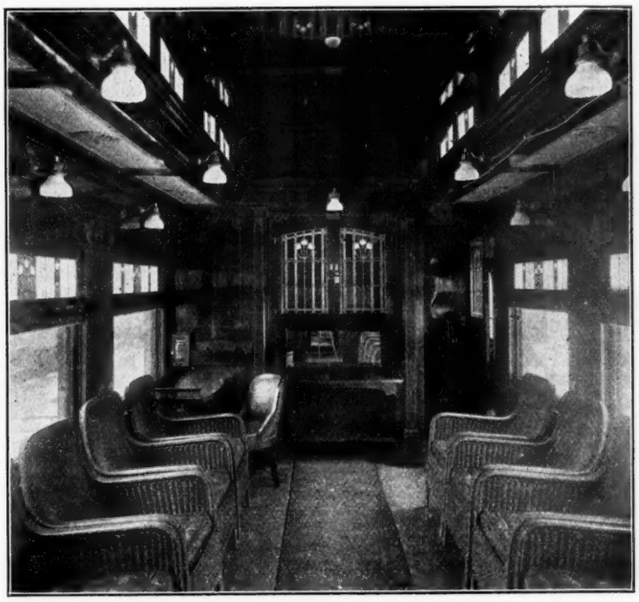
The arguments advanced when any disinclination is shown on the part of the recipient to be a party to the transaction are always insidious and frequently end by his scruples, if he has any, being overcome, and his conscience quieted by a plausible presentation of alleged counter-obligation. This usually takes the form of recognition of courtesy extended to the giver through the past year; as if ordinary business courtesy were so scarce as to require special recognition, or be made the subject of barter.

The enormous extent to which the practice has grown would lead to the inference that railway officials of high or low degree were the most courteous set of men on earth, a fact which would hardly be borne out could some of the private conversations among supply men be introduced in evidence. Altogether, the practice as a whole is debasing, if not immoral, and its prevalence is greatly to be deplored. I express my earnest conviction when I say that it should be abolished, not only for the good of the railways, but of the individuals, and in the interest of a higher business morality, and I hope that the fearless attitude of the *Railway Age Gazette* in bringing this question so forcibly and openly to the attention of all those immediately concerned will correct the evil which has been so vividly pointed out.

EX-PURCHASING AGENT.

THE SANTA FE TRAIN DE LUXE.

The Santa Fe was the first railway to place in service a limited train from Chicago to southern California, and after 16 years of successful operation of such trains it has determined to inaugurate an extra-fare service once a week, taking only 63 hours between Chicago and Los Angeles. This train, which is named

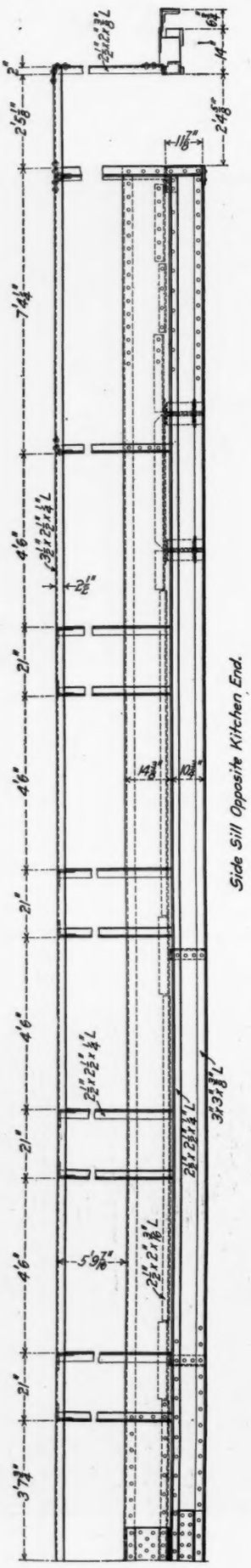


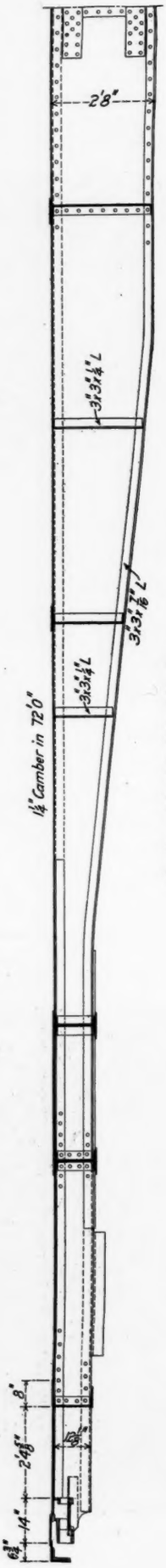
Buffet Car; Santa Fe Train de Luxe.

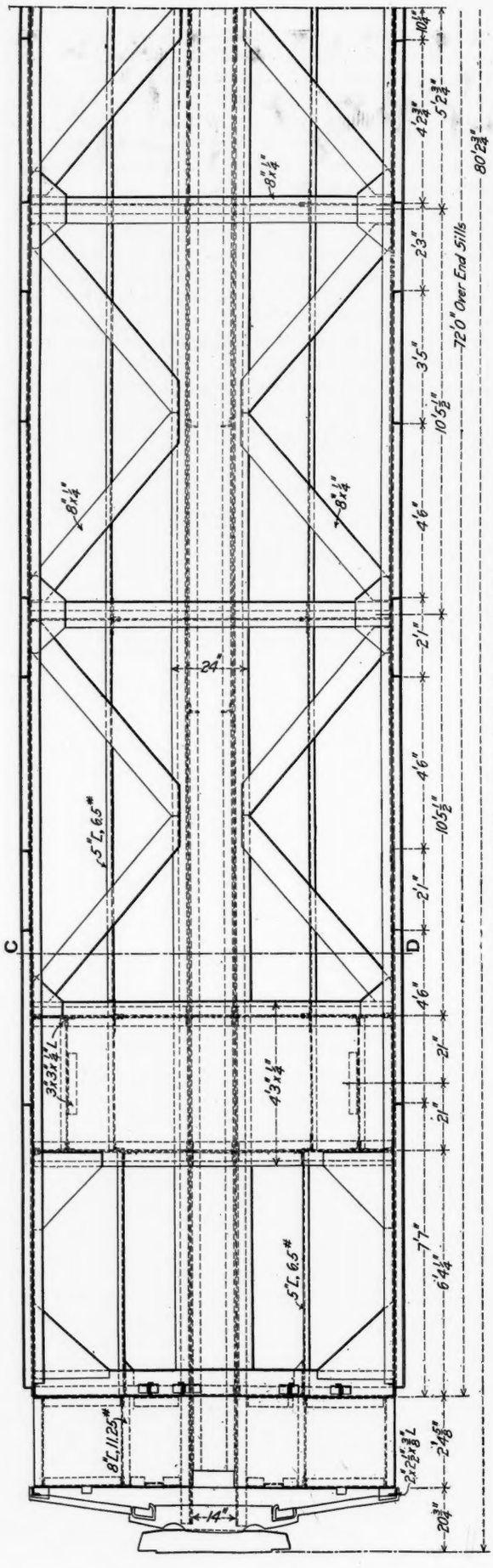
the "Santa Fe de Luxe," commenced its first run on December 12, 1911, being scheduled to leave Chicago at 8 p. m. Tuesday, Kansas City at 8 a. m. Wednesday, and to arrive at Los Angeles at 9 a. m. Friday. On the return trip it leaves Los Angeles at 6 p. m. Tuesday and arrives in Chicago at 11:10 a. m. Friday. This is faster by 5½ hrs. westbound, and by 8 hrs. eastbound, than the next fastest train on any line between these points. The distance by the way of the Santa Fe is 2,267 miles.

The "Santa Fe de Luxe" is limited to six through cars, one observation Pullman, one compartment Pullman, two all-drawing-room Pullmans, one club car and one dining car. In addition to the cost of regular first-class railway and sleeper tickets, an extra

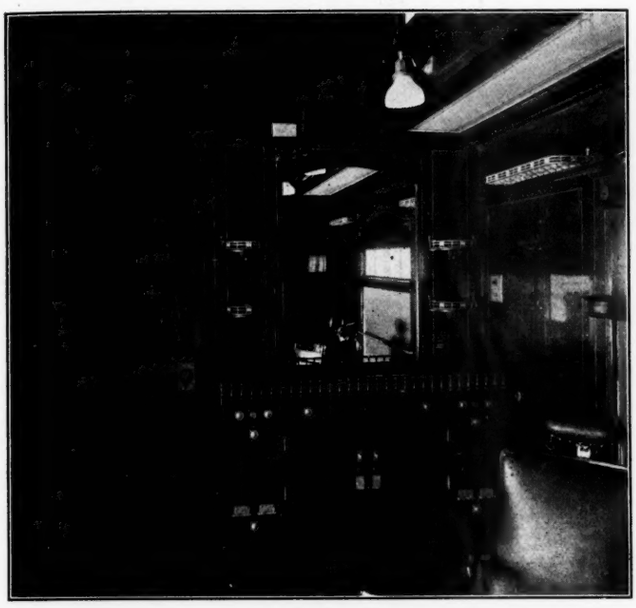
Dining Car; Santa Fe Train de Luxe.







Steel Underframe of Dining Car; Santa Fe Train de Luxe.

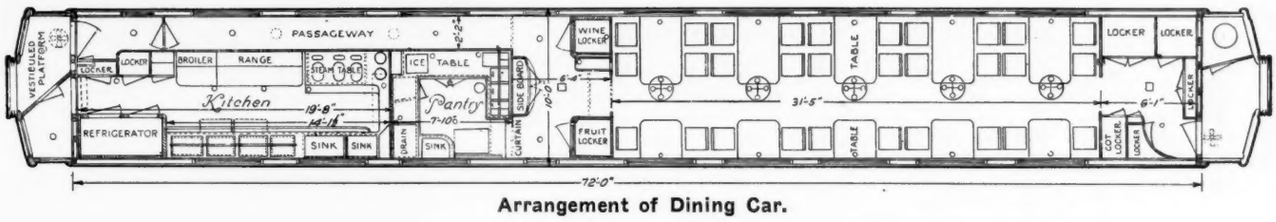


Barber's Room in the Buffet and Baggage Car.

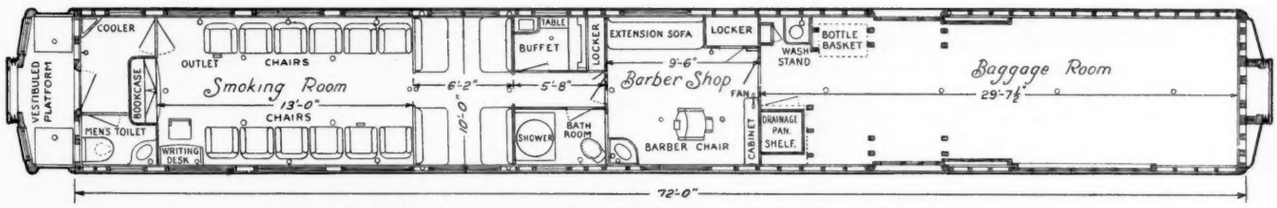
seven rooms, which have two double berths and a sofa berth. Individual annex lavatories and toilets are provided as well as electric berth lights. Six of the drawing-rooms may be occupied en suite. These cars are built from the recent Pullman designs using its type of steel underframe and cellular steel siding; the inside finish is mahogany.

The club car has a commodious smoking and reading room for men, with a fully stocked buffet. Bulletins by wire, giving the day's stock market report and important news items are received here. There are also the usual conveniences of the club car, including a writing desk, magazines, barber shop and tub bath room with shower. The front part of this car for a length of 29 ft. is used for baggage.

The dining car is built from special plans, which include a recently invented air-cooling and air-washing device that perfectly ventilates the car. The indirect system of electric lighting is used for general illumination, and the center lamps are enclosed in handsome metal pendants which contain the reflectors. The table lamps have ornamental shades and are below the level of the eye. The interior finish is vermilion mahogany. The dining car underframe and superstructure was designed by the engineer of car construction of the Santa Fe and the inside finish by the Pullman Company. It is 72 ft long over the end sills and weighs 144,000 lbs. The cross section and longitudinal plan of the steel underframe are illustrated. The center sills are of the fish belly

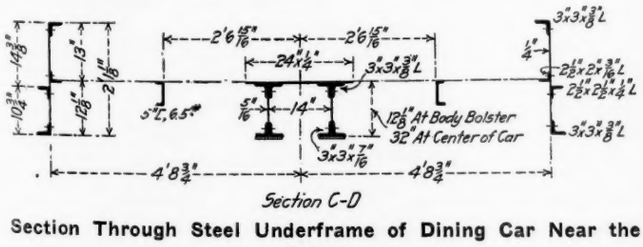


Arrangement of Dining Car.



Buffet and Baggage Car of the Santa Fe Train de Luxe.

fare of $25 is charged in each direction between Chicago and Los Angeles. The observation Pullman contains ten sections forward and an observation parlor with a large protected rear platform. Each section has two double berths with electric sidelights. The rear half is a spacious observation parlor sumptuously furnished. It contains easy chairs, a writing desk, stationery, a library of the latest fiction, newspapers, illustrated weeklies and magazines, a mail box, etc.



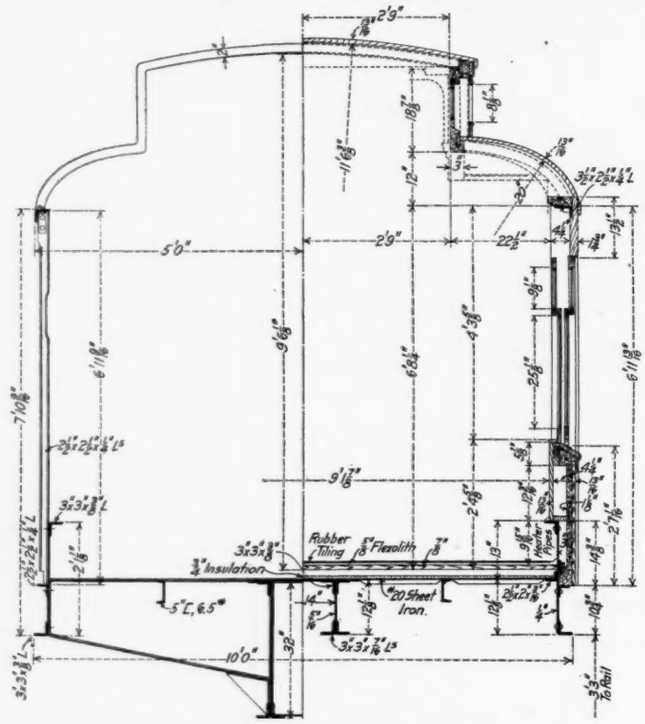
Section C-D

Section Through Steel Underframe of Dining Car Near the Bolster.

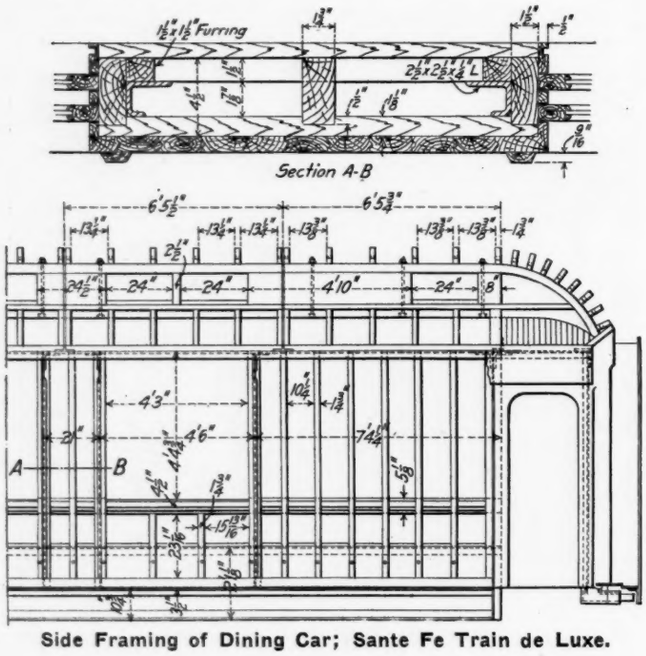
The compartment Pullmans contain seven compartments and two drawing-rooms, each compartment having two wide double berths, individual lavatory and toilet. Baggage racks, electric lights and electric curling iron heaters are among the conveniences. Doors lead to adjacent rooms, which rooms may be occupied en suite if desired. The drawing-room Pullmans each have

Buffet Car; Santa Fe Train de Luxe.

type with webs 5/16 in. thick. and 32 in. deep at center and 12⅛ deep at the body bolster. The top cover plate is ¼ in. x 24 in. The side sills have webs ¼ in. thick and are 25⅛ in. deep; 10¾ in. of this extends below the siding, and is stiffened with angles on the outside as shown in the cross section of the car. The longitudinal floor bearers are 5 in., 6.5 in., channels. The floor is covered with No. 20 sheet iron; on top of this is ¾ in. of insulation, ⅞ in. flooring boards, ⅝ in. flexolith, and a wearing surface of rubber tiling. In the woden superstructure 2½ in. x 2½ in. x ¼ in. special angles are placed next the window posts, and these are riveted to the side sills and to the 2½ in. x 3½ in. x ¼ in. angle iron plate. In the end construction 4 in. steel channels are bolted to each wooden post; the corner posts are reinforced with angle irons, and the whole outside end surface is covered with steel plate ⅛ in. thick.



Cross Section of Steel Underframe Dining Car.



Side Framing of Dining Car; Sante Fe Train de Luxe.

REPORT OF THE HADLEY SECURITIES COMMISSION.

The securities commission appointed by President Taft to investigate the question of Federal regulation of the issuance of securities by railway companies, has made its report to the president, who has submitted it to Congress with his approval.

The specific recommendations for positive action that the commission makes are as follows:

That a railway doing interstate business should be required to furnish the Interstate Commerce Commission, at the time of the issue of bonds or stock, with a full statement of details of the issue, the amount of the proceeds, to whom they go, and later to furnish a full accounting of such proceeds.

That every company be required to send the Interstate Commerce Commission at certain specified times a full statement including the names of the parties concerned, of all financial transactions that have taken place during the periods covered by the report, whether in cash, in securities or in other valuable considerations. This statement is also to include the disposition of surplus.

That whenever a railway buys new property, every means should be placed at the disposal of the Interstate Commerce Commission to ascertain the value of the property as accurately as possible, a fundamental, though not necessarily controlling element in value being cost of reproduction.

That the Interstate Commerce Commission be given broad powers and adequate means for the valuation of the physical property of railways are as one element in determining fair value.

That if stock has a par value, it must represent that amount actually paid in, but that if it purports only to be a participation certificate giving a proportionate interest in any profits that may be earned, it must be understood that this is its essential character, and that if it claim any further rights than this, it must prove them by specific evidence.

That the intercorporate holding of railway stocks and the issue of collateral trust bonds against stocks should be discouraged but not forbidden.

That the two ways by which federal and state regulation may be prevented from interfering with each other are a full interchange of views between the Interstate Commerce Commission and the commissions of the several states as a means of securing harmony, or, second, of a federal incorporation act which shall permit railways to exchange their state charts for federal ones, and that such an act could be drawn in such a way as to offer advantages in the conduct of interstate traffic without unduly conflicting with local interests; that whichever alternative of these two is adopted, any disturbance but a voluntary of the existing amounts or status of bonds or stocks validly issued is clearly inadmissible, and in general there should be as little disturbance as possible in the relations today existing between different classes of security holders.

That no restrictions excepting those of publicity should be placed on the powers of the directors to issue new stock pro rata to their stockholders at or above par, even though the price received be less than the existing market value of the old stock.

That if a document says $100 has been paid, $100 ought to be paid. The most that can properly be done is to allow companies which cannot sell stock at par to arrange for the "amortization" or gradual cancellation of any net discount by appropriating out of future income or surplus which may accrue subsequent to the issue of such stock, an annual sum having precedence over dividend payment to be applied on capital account as to make the deficiency good in a period of no very great length.

That the retention of the $100 mark, or any other dollar mark, on the face of the share of stock is not essentially important, and that companies should be encouraged to incorporate with stock having no par value, and that existing companies be encouraged to exchange their stock into shares without a par value.

That as between the two alternatives of permitting the issue of stock below par, or authorizing the creation of shares without par value, the latter seems to the commission the preferable one.

That in the case of reorganizations, the advantages of shares without par value are obvious. In such cases the public interest would be subserved and the speedy rehabilitation of the roads promoted by requiring the conversion of common stock and encouraging the conversion of preferred stock into shares without par value, the certificates simply indicating the proportion or preferential claims of the holders on assets and on such profits as might from time to time be earned.

That in general no limitation should be placed on the price at which bonds can be sold, but that any discount should be canceled or amortized during the life of the bonds by appropriation each year out of income or accumulated surplus.

That no attempt should be made by statute to limit railway profits to a fixed percentage, or to treat a high cash dividend as necessarily indicating extortion.

That script bond and stock dividends should be prohibited. The prohibition of script dividends should of itself encourage the creation of proper reserve funds. Freedom from arbitrary restriction of profits, prohibition of script dividends and creation of proper reserve funds hang closely together. Any one by itself may be of doubtful value; taken together they should produce a result advantageous to all.

That an unqualified prohibition of the ownership of stock of one road by another involves too much disturbance of existing relations to warrant advocating it.

That any company or group of companies that has bought a majority of the stock of any existing road may properly be required to buy the minority stock at the same price as that paid for the majority stock where the price has been uniform. If the price has not been uniform the purchase should be either at the average price paid for such holdings, or at a price to be fixed by an appraiser at the option of the minority stockholders.

That if a company has acquired control of the common stock of another, but not of its preferred, it should be required either to buy the preferred stock or to make the preference cumulative.

That after such an offer, as indicated by the two preceding paragraphs, has been fairly made by the majority, a three-fourths vote of the stockholders should be sufficient to dissolve the corporation.

That the purchase of less than a majority of the stock of one line by another, except as one of the group of railways jointly holding the stock of some connecting company, should be discountenanced, and as far as possible prohibited.

The commission sums up the points to be emphasized as follows:

1. The questions presented for its consideration do not include or involve a comparison of the policy of governmental ownership of railways, with the policy of private ownership in any of its forms. The act of congress under which the commission was appointed provides that its duty shall be "to investigate questions pertaining to the issuance of stocks and bonds by railway corporations, subject to the provisions of the act to regulate commerce and the power of congress to regulate or affect the same. The commission has, therefore, concerned itself exclusively with questions which arise under a system of governmental regulation of privately owned railways.

2. It has not seemed to the commission profitable to consider at length what the government might have done in times past, nor to enter upon a historical recital of incidents arising out of the unregulated issue of securities. Railway development has gone so far and such a vast volume of securities has already been issued, that the only questions of real importance today are whether, under the conditions which now exist, it is desirable for the federal government to regulate the issue of future securities, and if so, to what extent and in what manner. In other words, the large volume and complex relationships of the outstanding securities, the issue of which has not been regulated at all by the federal government and has not been effectively regulated by the state governments, make it impossible to treat the question of present or future regulation as it might have been treated if these securities were not already in existence.

3. It would have been equally unprofitable for the commission to enter upon an elaborate discussion of the power of congress to regulate or affect railway securities, at a time when important cases are pending which will go far to determine the scope and extent of federal authority in this and other closely related subjects. Such a discussion could only state the opinion of the members of the commission regarding the constitutional power of congress. The issues themselves will remain undecided until the Supreme Court decides them. Whatever may be the ultimate outcome, the present fact which faces us is that constitutional questions of far-reaching consequence are today unsettled and must remain so for a considerable time. Uider these circumstances, any attempt by congress to adopt the policy of federal regulation to the exclusion of state regulation would be premature. On the other hand, to superimpose federal regulation upon state regulation would add to conflicts and complexities which, in the public interest, should be diminished rather than increased. Your commission believes that for the present an earnest effort should be made on the part of state authorities to harmonize existing requirements, both of law and procedure, and that for the future careful consideration should be given by congress to the preparation of a permissive federal incorporation act for railways engaged in interstate commerce.

4. Many, if not most, of the abuses connected with railway securities arise out of an almost universal failure to recognize the distinctions which exist and should exist between bonds and stocks. A bond is an obligation to pay a fixed sum of money at a stated time. A stock certificate is merely the evidence of ownership of a share in the property, profits, and risks of a corporation. Most of the evils of which investors and the public complain have grown out of the attempt to give to stock a face value in terms of money. Even if the state laws prohibiting the issue of stocks for less than par were literally enforced, all that the recitals on the face of a fully paid share of stock as to its par or money value would signify is that at the time of the issuance of the share there had been paid into the corporation an amount of money (or other valuable consideration) equal to the par value of the share. They do not even purport to indicate that at any time after the original issue of the stock the corporation was possessed either of the money or the money's worth. The real value of the stock certificate depends upon the manner in which the money has been invested. The commission is, therefore, of the opinion that it is far more important to ascertain just what are the facts connected with the issue of securities and what is actually done with whatever money has in fact been realized from the stock which is issued, than merely to make sure that the par value of the stock was paid in at the time of issue.

5. If we were compelled to assume that rates are to be materially influenced either in their making by the railways or in their regulation by the government by the amount and face value of the stocks and bonds outstanding, it seems to your commission impossible to escape the conclusion that these securities should be issued only under governmental regulation. Your commission, however, believes that the amount and face value of outstanding securities has only an indirect effect upon the actual making of rates and that it should have little if any weight in their regulation.

In so far as the value of the property is an element in rate regulation the outstanding securities are of so little evidentiary weight that it would probably be of distinct advantage if courts and commissions would disregard them entirely, except as a part of the financial history of the property, and would insist upon direct evidence of the actual money invested and of the present value of the properties. For this and other reasons discussed in the body of the report, your commission recommends that the Interstate Commerce Commission should have authority and adequate funds to make a valuation of the physical property of railways wherever the question of the present value of these roads is, in the judgment of that commission, of sufficient im-

portance. It is hardly necessary to add that your commission does not believe that the cost of reproduction of the physical properties, however carefully computed, is the sole element to be considered in determining the present value of a railway, or that the outstanding securities could or should be made to conform to any such arbitrary standard.

If railway securities were to be issued only after express authorization of each particular issue by the Interstate Commerce Commission or other governmental agency, it is difficult to see how the government can thereafter escape the moral, if not the legal, obligation to recognize these securities in the regulation of railway rates. In view of the vast extent of the railway systems of this country and the magnitude of the financial interests involved, both on the part of the railways and of those who pay the rates, your commission believes that the possible consequences of such a system of regulation are too serious to warrant its adoption at the present time.

6. Upon the whole, your commission believes that accurate knowledge of the facts concerning the issue of securities and the expenditure of their proceeds is the matter of most importance. It is the one thing on which the federal government can effectively insist today; it is the fundamental thing which must serve as a basis for whatever additional regulation may be desirable in the future.

SUGGESTIONS RELATING TO PUBLICITY, INDICATING POINTS UPON WHICH AMENDMENTS TO THE ACT TO REGULATE COMMERCE MIGHT BE BASED.

[*This commission has not considered it proper to present a formal draft of a statute.*]

Every railway corporation subject to the provisions of the act shall file with the Interstate Commerce Commission on or prior to the date of issuance of any stocks, bonds, notes or other evidences of indebtedness payable at periods of more than twelve months after the date thereof, and now or hereafter to be authorized, a certificate of notification in such form as the commission may from time to time determine and prescribe which shall show:

First (*a*) The total amount thereof authorized.

(*b*) The number and amount thereof outstanding prior to the date of such certificate; the amount thereof theretofore retired; the amount therefore then undisposed of, and whether such amount is held in the treasury of the corporation as a free asset, or pledged, and if pledged, the terms and conditions of such pledge.

(*c*) The number and amount thereof then to be issued and whether to be sold, pledged or held in the treasury of the corporation as a free asset; if such securities are to be sold, the terms of sale if a contract for such sale has been made, and if any part of the consideration to be received therefor is other than money, an accurate and detailed description; thereof; if such securities are to be pledged, the terms and conditions of such pledge.

(*d*) The number and amount thereof remaining unissued.

(*e*) If the issue is of shares of stock, the certificate shall also show the par value thereof, or if the issue is of shares of stock that have no specified nominal or par value, the number of such shares, and the number of then outstanding shares previously issued.

Second: The preferences or privileges granted to the holders of any such shares of stock; the dates of maturity, rates of interest of any such bonds, notes or other evidences of indebtedness, and any conversion rights granted to the holders thereof, and the price, if any, at which such shares or bonds may be redeemed.

Whenever any securities set forth and described in any certificate of notification as pledged or held as a free asset in the treasury of the corporation shall subsequent to the filing of such certificate be sold or repledged or otherwise disposed of by the corporation, such corporation shall file a further certificate of notification to that effect, setting forth therein all such facts as are required by subdivision (*c*) of the foregoing first paragraph.

The provisions in regard to certificates of notification shall apply to notes or evidences of indebtedness running for periods of twelve months or less, and to the pledging or repledging of stocks, bonds or other evidences of indebtedness to secure such notes or evidences of indebtedness running for periods of twelve months or less, except that such certificates may be filed within ten days after the issue thereof instead of on or prior to the date of such issue.

Every such railway corporation shall furnish to the commission, at such time or times as the commission may require, in addition to its income account, a balanced statement of its receipts and expenditures on capital account, and of the surplus of the income account accruing during the period covered by such statement, as well as of all other financial transactions that have taken place during such period, with whom had, whether in cash, in securities, or in other valuable consideration.

The commission may also require the carrier to furnish any further statements of fact or evidence that it may deem necessary or appropriate.

The certificates of notification, and any other written statement furnished to the commission under the act, shall be signed and verified by the auditor, comptroller, or other acting fiscal head of the carrier.

It shall be the duty of the commission to enforce these provisions, and to make public by appropriate means the information received, as, in its discretion, it may deem proper; and such certificates of notification shall at all times be deemed public records and open to inspection.

The commission may also require the carrier to compile for the information of its shareholders such facts in regard to the financial transactions of the carrier for its fiscal year in such form as the commission may direct. The carrier may be required by order of the commission to disclose every interest of the directors of such carrier in any transaction under investigation. The commission shall have the power to investigate all such transactions and to inquire into the good faith thereof, to examine the books and papers of carriers, construction or other companies or of firms or individuals with which the carrier shall have had financial transactions, for the purpose of enabling it to verify any statements furnished, and to examine into the actual cost and value of property acquired by, or services rendered to, such carrier.

Appropriate penalties, including fine and imprisonment, should be provided for violation of these provisions.

FOREIGN RAILWAY NOTES.

The government of Brazil has accepted the project to construct a branch of the Central Railroad of Brazil from Cascadura to Ilha, this branch to be completed within two years.

The Swedish part of the railway which carries the iron ore of Gellinara to the Norwegian port Narvik (near the Arctic circle) earned a profit of 10.65 per cent. on its cost last year, though it has been open but a few years. This line, which is a narrow gage road and belongs to the state, is being electrified.

Far greater care is now exercised in granting railway concessions in Argentina than formerly. Not many years ago valuable concessions could be obtained with a stipulation to the effect that competing lines should not be allowed within a certain radius. Under these conditions existing railways found that they could not branch out into certain territories unless they bought out the person holding the original concession, who, as a rule, had no intention of constructing. Often the purchase of the concession could not be effected, and this resulted in serious damage to the territory supposed to be benefited. This is now largely prevented by the exaction of a guaranty from the individual or corporation seeking the concession.

A TERMINAL CAR RECORD.*

BY W. E. BEECHAM,
Car Accountant, Chicago, Milwaukee & St. Paul.

The large terminal where thousands and tens of thousands of cars are to be found at all times is a good place to look for the introduction of economy in the use of cars and engines, and anything which makes that possible is worth looking into. The large terminal is the key to the situation, and, if the ground can be effectively and economically covered by some method that will reveal at a glance to the eye of the superintendent the imperfections of existing methods, there should be a way of correcting them, but the trouble is imperfections are not brought to the attention of those having the power to remedy them in regular methodical and continuous progression.

When failures occur in the service an investigation is set on foot, and, if defects are unearthed in the line-up for handling traffic in any special case, remedies are applied. In other words, when a hole is found it is plugged up, but sporadic efforts do not cure the disease, so very little good results.

In this connection we should remember that whenever men like ourselves, possibly but little better, probably not in the least worse, continually fail to give us the results we have a right to expect from their efforts, we may just as well make up our minds that the fault lies, not in their personalities, but in the conditions under which they work, and profit comes not from denouncing them, but from seeing that the conditions are changed.

Nothing is more discouraging to the average man than working under conditions which preclude the possibility of rendering efficient service, and, in addition thereto, if he is unjustly criticized for failures he cannot avoid, he soon settles down to a condition of indifference, if not hopelessness, from which it is hard to rouse him.

A railway is a thing of great magnitude requiring a high order of intelligence in all its branches, and an organization like unto a regular army minus the red tape.

All departments must be directed with unerring certainty if the best results are to be obtained. It is seldom that we can let the privates fight it out, as General Grant did on more than one occasion when the situation got beyond him. In this business we must cut the work out for the privates, and see that they do it as planned for them, and, if the conditions are unfavorable for the results required, we should change the conditions, but before we can do that we must be able to gather full and complete information daily of the minutest details of operation, and by careful analysis deduce therefrom the comforting assurance that everything is moving with clockwork regularity under a line-up as near perfection as we can hope to get it, and that all we have to do is keep it so, or, if the reports indicate weak spots in the line-up, they must be strengthened, until conditions are made as nearly favorable for the results desired as is possible.

I am proceeding upon the theory that the magnitude of the operations in such terminals as Chicago, St. Louis, Buffalo and others in that class under normal conditions precludes the possibility of keeping close enough in touch with the details of operation every hour of the twenty-four to enable the superintendents to detect instantly and immediately remedy defective work with the present system for gathering information, because the expense is prohibitive, but it is safe to assume that without a complete and nearly perfect system for gathering information scientific supervision cannot be maintained.

It is the knowledge of everything going on that places in the hands of the superintendent the power to rectify his line-up by changing methods here and altering plans there, so as to promptly meet the exacting conditions of commercial requirements, but the information must come to him in comprehensive form and must not be too voluminous, otherwise it cannot be made available for practicable use.

In a large terminal where 5,000 cars or more are to be found at all times, the difficulty of keeping in real close touch with every detail of operation is better known to those who have had actual experience in running such a terminal than it is to me, and I will not dwell long on that, but the reason that remedial measures have not been inaugurated in many cases is because, the operations being an a scale of such magnitude, and covering an area of such great extent, the mind cannot grasp it at all, and the means for getting the details are inadequate.

No one will take issue with the statement I think that loaded and empty cars make many false and unnecessary moves in large terminals, involving loss of time, waste of labor and useless expense, but they are obscured by difficulties it seems harder to overcome than it probably is because their real nature is concealed in doubt owing to a lack of means for gathering information promptly and of a reliable nature.

We also know that serious delays occur to cars under load in switching and through service which are not altogether justified by conditions and that empty cars are not moved as promptly as they should be, and that the power is not always used to the best advantage, and that it is not always fully employed. But this knowledge is general rather than specific, and on that account is not of as much value as it would otherwise be.

In order to overcome this uncertainty or lack of positive information, we decided to try out a new scheme for recording the movements of cars within and through one of our largest terminals where the traffic passing in transit is very heavy and the traffic originated is larger than it is at any other point on the line. In this scheme we use no books, pens or pencils, and in that respect it is a radical departure from old methods.

In the place of these articles we use a board marked off into squares of about 1¼ in. Each space has a hole in which an aluminum pin is inserted. This pin is about 4 in. long and has a washer near one end which prevents it from going through the board. The boards are divided into sections, each section provides for about 500 cars.

The process of making these records is as follows:

Incoming trains leave way-bills and wheel reports and a carbon copy of the wheel report at the yard office, the yard clerk sends the wheel report and carbon copy to the record room. The record clerk forwards the original wheel report to the car accountant, Chicago, and keeps the carbon copy from which a record of cars arriving is made. Outbound trains make list of their cars before departing and call at the yard office for the bills. Bills are checked with the list and the list is forwarded to the record clerk, and from these lists the record of cars departing is made.

Track lists of the entire terminal, except live tracks, are taken every morning except Sunday, and these lists are transferred with the reports of cars arriving and departing.

Card lists are made by all switch engine foremen of cars moved from yard to yard. These lists are not transcribed, but are held in file and used in analyzing the movement of traffic in and through the terminal so that intraterminal movements of the cars are available for the purpose of investigation.

It is proper to emphasize here the fact that the record shows the time of the arrival of trains in the terminal, the time they are switched and all the subsequent movements the cars make thereafter, so that the time in hours and minutes from the time a car arrives until it departs can be shown if desired for any purpose, and its whereabouts every day during the time it is in the terminal accounted for.

In making the records we use a visible typewriter for transcribing the initials and numbers of the cars, numbers of trains and dates or numbers of tracks where located to a tag about an inch square. This tag has a hole punched at one end and is perforated at the other. The tags come in rolls of tape, 2,000 in a roll, and the perforation is for convenience of separating them.

As fast as the reports are transcribed the tags are sorted in numerical order and placed on the pins where they belong, and are then ready for reference.

*A paper read before the St. Louis Railway Club.

As long as a car remains in the terminal the tag showing its arrival stays on the pin where it was first placed; after it departs it is placed on another and longer pin for permanent record. By this process only cars actually in the terminal show on the record.

This completes the recording of cars, and given a car number the record clerk should be able to furnish the following information:

When and by what train it arrived.

When train was switched up.

When and by what engine it was moved from yard to yard.

When and by what engine it was placed for unloading.

When and by what engine it was taken from a side track, and every subsequent move it makes until it leaves the terminal, and when and in what train it departs.

It may be said that this information would be too voluminous for practical use, but it must be remembered it is not necessary to use it all. The movements of 100 cars will as clearly indicate to the mind competent to analyze them the condition of efficiency in the terminal just as satisfactorily, just as fully and completely as a thousand times that number could or would, but, in order to be able to extricate from a mass of details sufficient information for analytical purposes, a record of all the transactions must be kept.

If the movements of cars over the entire system could be regulated from a common center with such unerring prescience that every shipment (carload or less than carload) would inevitably reach its destination and be delivered to the consignees with reasonable despatch, there would be an end to local supervision, but that is impossible, the area to be covered is too extended, and the facilities for keeping in touch with the situation every hour in the day are too limited to make that possible. We must depend on intelligent scientific local supervision for the results we are looking for, and that, backed by an organization for keeping in touch with the operations so closely that no failure, no matter how unimportant it may seem to be, will escape the vigilance of those who ought to know about it, will, I think, most nearly meet the situation.

Traffic which moves with regularity and reasonable despatch, and a very large per cent. of it does, gives us no concern, but that per cent. of it which does not must be looked after. Our efforts to get this per cent., however small it may be, to an irreducible minimum must be unceasing and never flagging, because therein lies the secret of success in the transportation business.

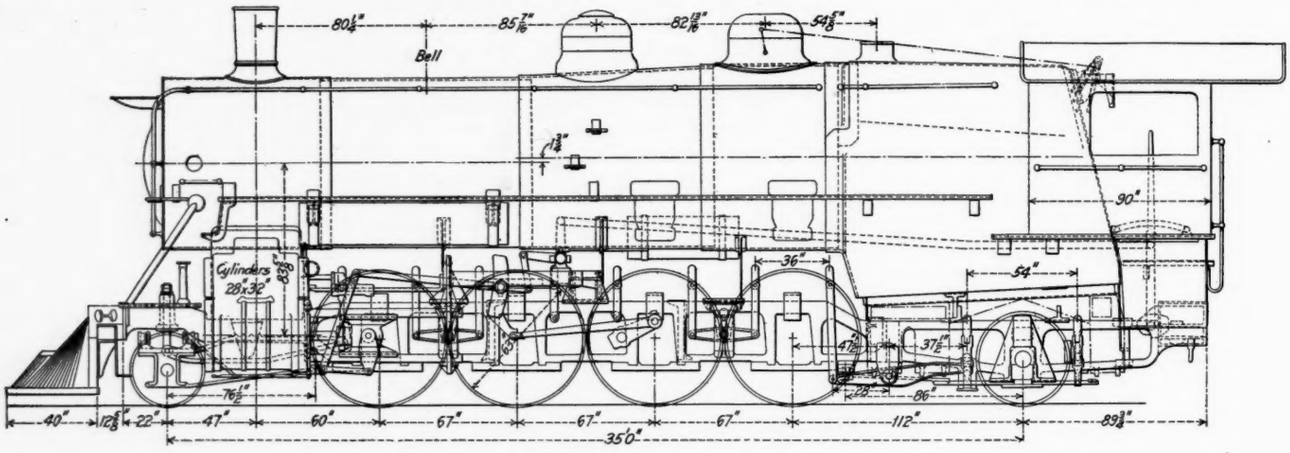
The terminal record referred to affords us the facilities for correcting abuses or failures. I should, perhaps, correctly say, by revealing them. It only remains for those in charge to make use of them.

Besides that, it provides the means for taking a daily inventory of the number of cars on hand empty, and to unload, by classes, and the numbers of cars loaded during the past 24 hours, very essential information for distribution purposes and the making of reports to the general office.

My experience with this new plan leads me to think that every large terminal should have a man in charge of the card records, distribution, making of reports and everything pertaining thereto, if the best results are to be obtained, and that he should report direct to the superintendent of terminals, or the highest officer in charge located there.

MIKADO LOCOMOTIVES FOR THE GREAT NORTHERN.

The Great Northern has recently received 20 Mikado locomotives from the Baldwin Locomotive Works. Each locomotive has a total weight of 287,000 lbs., with approximately 55,000 lbs. on each pair of drivers. They are similar to the locomotives of the same type recently delivered to the Illinois Central, which were described in the *Railway Age Gazette,* September 29, page 585, in that they are only 3,000 lbs. heavier and have superheaters with very nearly the same amount of superheating surface. They differ, however, in that the cylinders are larger, being 28 in. x 32 in., as compared to 27 in. x 30 in. for the Illinois Central, and the boiler pressure is 5 lbs. less, or 170 lbs. This gives the Great Northern locomotives a tractive effort of



Elevation of Mikado Locomotive; Great Northern.

57,500 lbs., which is about 5,800 lbs. greater than that of the Illinois Central engines.

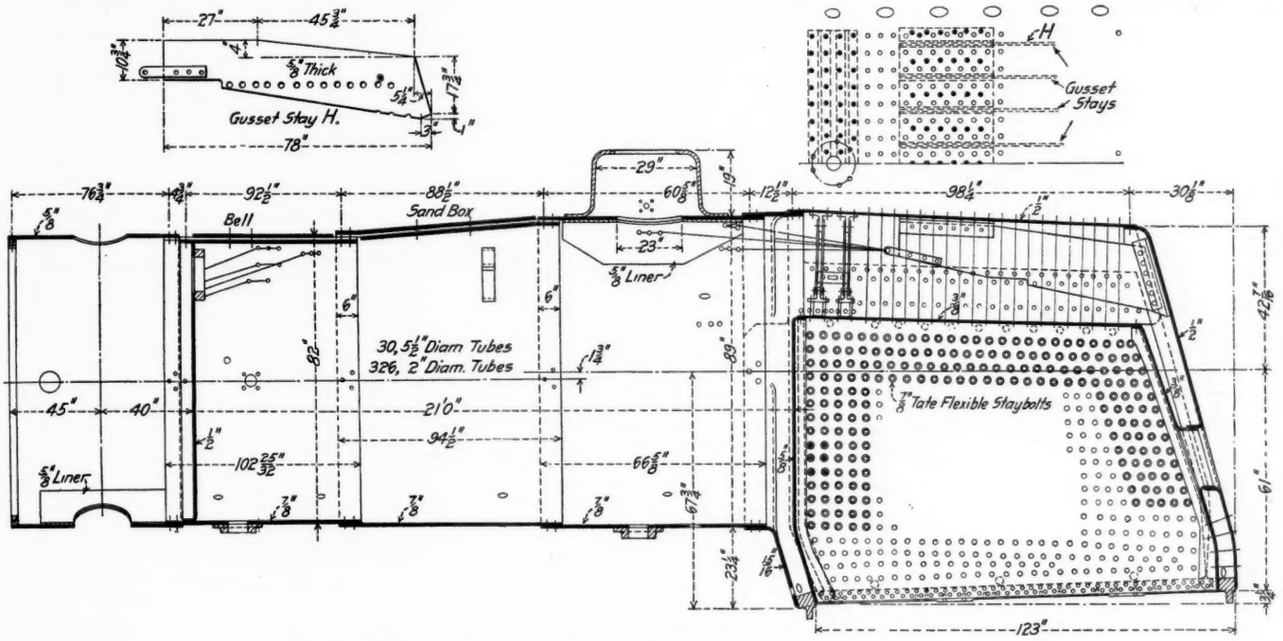
The present tendency in freight locomotive design is to increase the relative boiler capacity, thus enabling the engine to maintain better speed over the road, and to handle its full rating with less liability of steam failures. With the 2-8-2 wheel arrangement, a boiler of the required dimensions may be applied, while the use of superheated steam materially increases the efficiency of the locomotive as a whole. The Great Northern locomotives show a high relative boiler capacity and in comparing their ratios with those of the Illinois Central Mikado it is found that although their steaming capacity, the proportion of heating surface to grate area, and of heating surface to cylinder volume, is nearly the same in both engines, there is a gain of 8.5 per cent. in the ratio of the total weight to the total equivalent heating surface, or, as it is sometimes called, the factor of efficiency. This, together with the increase in tractive effort, shows an improvement in this design of single expansion freight locomotives.

The boilers are of the Belpaire type and are similar to those of the 2-6-6-2 Mallet locomotives used on the same road. The shell is 82 in. in diameter at the front end and increases to 89 in. at the dome ring. The dome is of pressed steel and is made in one piece. The firebox crown and the outside roof sheets are both slightly arched, the crown stays passing through radially.

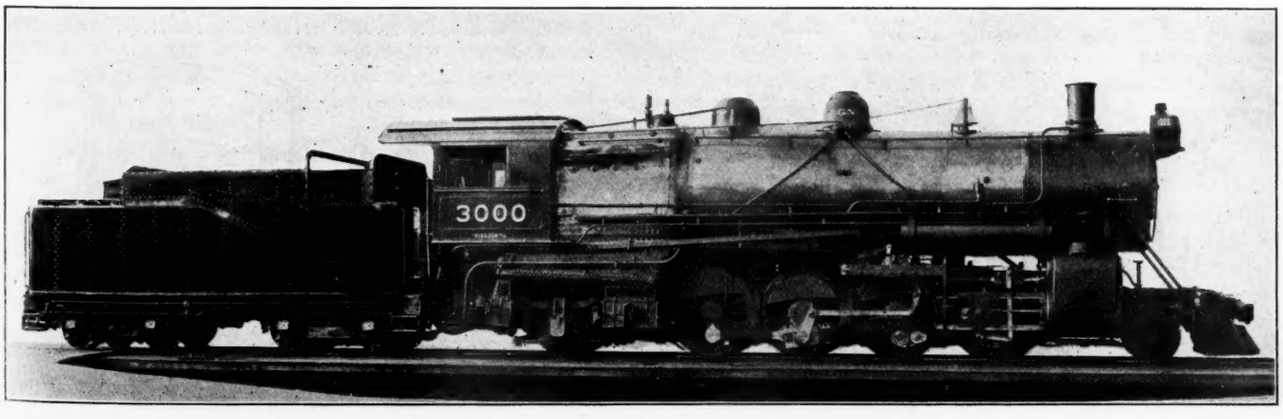
The back head is stayed by eight gusset stays. The water spaces are 5 in. wide all around at the bottom, increasing to 6½ in. at the crown on the sides and 8¼ in. on the back. The Emerson type of superheater is used which, with 326 2-in. tubes, gives a total equivalent heating surface of 6,310 sq. ft.; even though the superheating surface is 33 sq. ft. less than on the Illinois Central engines the total equivalent heating surface is 400 sq. ft. greater, both boilers having the same nominal diameter and only 6 in. difference in the length of tubes. The Illinois Central engines have an American Superheater Company's type *A* superheater.

The superheater is similar to those previously built for this road except that the saturated and superheated steam headers are cast separate from one another, and are bolted together at the top and bottom. The bolt holes are drilled of sufficient size to allow for expansion and contraction. There is a further advantage in this arrangement since an air space is provided between the header sections, thus minimizing the loss of heat by conduction through the header walls. The grate is composed of table bars, and rocks in four sections, having drop-plates at the rear. The ash-pan is built with six hoppers which have drop bottoms. These hoppers are placed outside the rail line, and are readily accessible so that the pan may be kept clean with little trouble. The cylinders, apart from their size, present no unusual features of construction. The barrel walls are thick enough to enable them to be subsequently bored to a diameter of 29 in., if desired. The live steam passages in the cylinder saddle are cross connected by an equalizing pipe, allowing each cylinder to draw on both the superheater sections for its steam supply. Built up piston valves, 13 in. in diameter, control the steam distribution. The valves are set with a maximum travel of 6 in. and a lead of 3-16 in. The steam lap is 1⅛ in. and the exhaust lap is zero. The by-pass valves are of the flat plate type, placed immediately above the steam chests.

Each main frame is cast in one piece with a single front rail which is 5 in. wide and 11 in. deep. The cylinder castings are keyed to the frames at the front only and are secured on each side by 7 horizontal and 4 vertical 1½ in. bolts. The rear frames are separate from the main sections and are arranged to accommodate the Hodges type of trailer truck. The mud ring is supported on the rear frames by expansion plates at the front and back. The throttle valve is operated from a horizontal shaft, which passes through a stuffing box in the right-hand side of the dome and has an external connection with the throttle lever. The latter is mounted in a vertical position on the back head of the boiler. The driving-wheel centers and boxes are of cast steel; the wheels have no hub liners, but the boxes are faced with babbitt. Castellated nuts are used on the connecting rods, valve motion work, crank pins, side rod knuckle pins and crosshead pins. The side rods are rectangular in cross section and



Belpaire Boiler for Great Northern Mikado Locomotive.

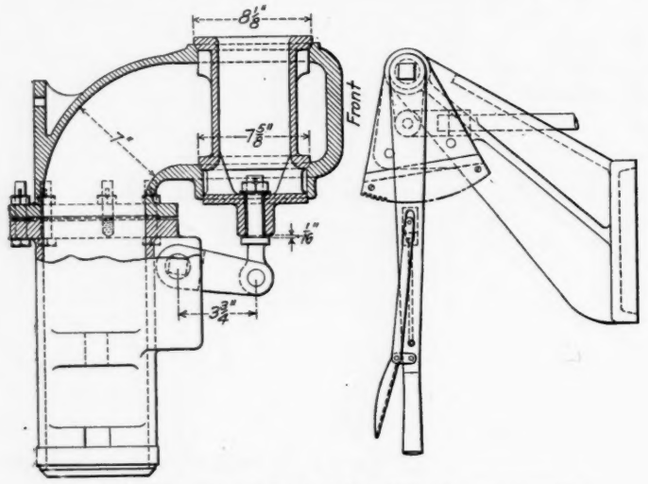


Mikado Locomotive for the Great Northern.

have solid and stubs except on the main pin where a strap stub is used with 3 bolts and a wedge adjustment. The back end of the main rod is forked with a wedge in front of the brass and two 2-in. bolts passing through the filling block in the back. The tender is designed in accordance with Great Northern standards. It has equalized pedestal trucks, and a steel channel frame placed as low as possible. The tank is of the water bottom type and is equipped with a coal pusher. The following are the principle ratios and dimensions for these engines:

General Data.

Type	2-8-2
Service	Freight
Fuel	Soft coal
Tractive effort	57,500 lbs.
Weight in working order	287,000 lbs.
Weight on drivers	220,000 lbs.
Weight of engine and tender in working order	435,000 lbs.
Wheel base, driving	16 ft. 9 in.
Wheel base, total	35 ft.
Wheel base, engine and tender	68 ft. 2 in.



Throttle Valve and Lever for Mikado Locomotive.

Ratios.

Total weight ÷ tractive effort	4.99
Weight on drivers ÷ tractive effort	3.84
Tractive effort × diam. drivers ÷ heating surface	767.
*Tractive effort × diam. drivers ÷ equivalent heating surface	574.
Total heating surface ÷ grate area	60.4
*Total equivalent heating surface ÷ grate area	80.7
Firebox heating surface ÷ total heating surface, per cent.	5.27
*Firebox heating surface ÷ total equivalent heating surface, per cent.	3.94
Weight on drivers ÷ total heating surface	46.6
Weight on drivers — total equivalent heating surface	34.85
Total weight ÷ total heating surface	60.8
Total weight ÷ total equivalent heating surface	45.4
Volume both cylinders, cu. ft.	22.78
Total heating surface ÷ vol. cylinders	207.
Total equivalent heating surface ÷ vol. cylinders	277.5
Grate area ÷ vol. cylinders	3.43

Cylinders.

Kind	Simple
Diameter	28 in.
Stroke	32 in.

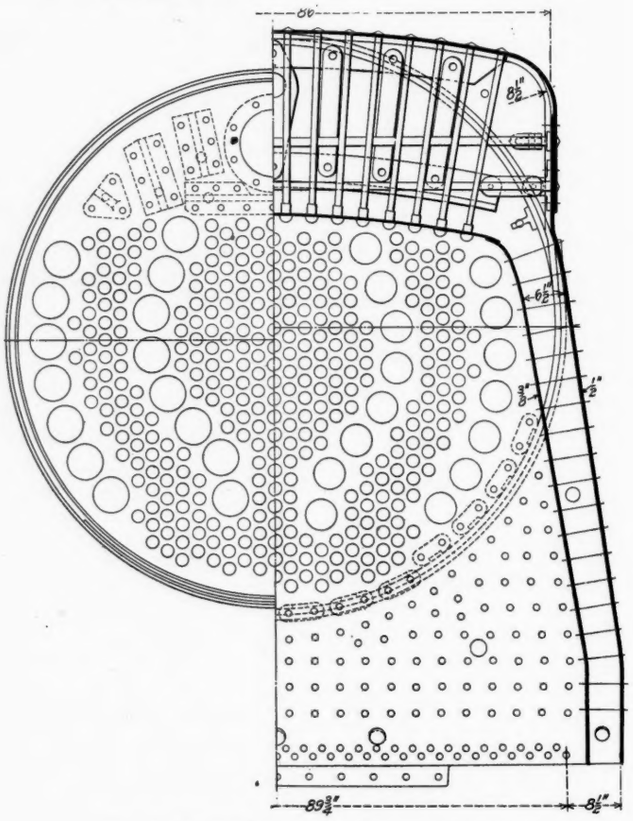
*Total equivalent heating surface equals total heating surface (4,720 sq. ft.) plus 1½ times superheating surface.

Valves.

Kind	Bal. piston
Diameter	13 in.
Travel	6 in.
Steam lap	1⅛ in.
Lead	3/16 in.

Wheels.

Driving, diameter over tire	63 in.
Driving, thickness of tire	3½ in.
Driving, journals, main, diameter	11 in. x 12 in.
Driving, journals, others, diameter	10 in. x 12 in.
Engine truck, diameter	33 in.
Engine truck, journals	6 in. x 12 in.
Trailing truck, diameter	42½ in.



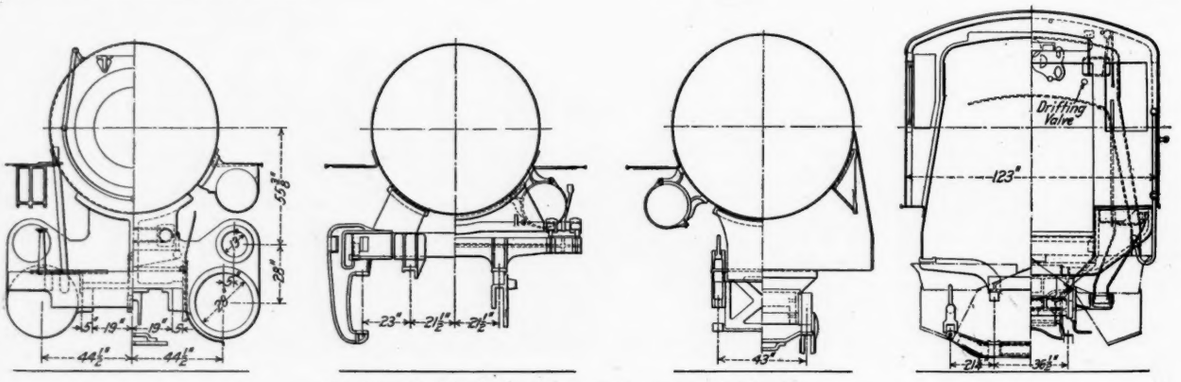
Partial Cross-Sections of Belpaire Boiler.

Boiler.

Style	Belpaire
Working pressure	170 lbs.
Outside diameter of first ring	82 in.
Firebox, width and length	96 in. x 117 in.
Tubes, number and diameter	326—2 in.; 30—5½ in.
Tubes, length	21 ft.
Heating surface, tubes	4,471 sq. ft.
Heating surface, firebox	249 sq. ft.
Heating surface, total	4,720 sq. ft.
Heating surface, superheating	1,060 sq. ft.
Heating surface, total equivalent	6,310 sq. ft.
Grate area	78.2 sq. ft.

Tender.

Water capacity	8,000 gal.
Coal capacity	13 tons.



Sections of Mikado Locomotive; Great Northern.

SAFETY COMMITTEES ON THE LACKAWANNA.

As was recently announced in these columns, the president and the general superintendent of the Delaware, Lackawanna & Western have appointed, on each of the divisions of the road, a committee to promote safety, following the plan which was brought to public notice a year ago by the action of the Chicago & North Western. Meetings of Lackawanna employees attended by four or five hundred have been held at the headquarters of several divisions already, and other meetings are to follow. At these meetings addresses were made by President W. H. Truesdale, General Superintendent T. E. Clarke, and by a number of division officers. Prominent in the utterances of the general officers was the declaration that not only were the employees expected henceforth to do their best to abolish, as far as possible, everything that endangers the lives or limbs of employees, but that the company itself, so far as lies in its power, would take action in the same direction. In some things the employee can do what the company cannot. As one of the officers put it, the division officers are expected to inspect the work and the premises with sufficient frequency to detect and remove all causes of danger; but this purpose cannot be completely carried out, and therefore there is a duty on employees to report to their superiors every incident, coming under their observation, which indicates that remedial measures ought to be taken.

Another point to which strong emphasis was given was that some employees—a class forming, perhaps, a very small percentage, but yet one which is always with us—indulge habitually in dangerous practices. "We are all more or less dependent upon one another, and it is especially so in the railway business. How often it is that the efficient and most careful man, the man who has the cleanest record, will lose his life or limb through the carelessness or lack of foresight of some fellow employee, often a man who is habitually careless and whose record shows he has been so addicted for years. It matters not how careful a man may be, his safety depends on the judgment and action of the individual with whom he works; and if that individual fails he may lose his life, and his widow and children suffer by reason thereof."

The officer who summarizes the accident statistics and who has to settle the bills for damages often proves to be the most accurate observer and the most thorough student of the causes of deaths and injuries among trainmen; and therefore it is not surprising to find that Claims-Attorney W. C. Wilson made one of the best addresses to the assembled Lackawanna employees. Mr. Wilson called attention to the report of the Chicago & North Western that for a recent period of four months not a single engineman or trainman was killed on the 8,000 miles of that road. Observing that the record of the Lackawanna was not so good as this, Mr. Wilson went on:

"Railway operation is a dangerous business and requires both skill and courage. This movement for safety is not to develop timidity; is not to make cowards; is not to make a man flinch when his duty calls him to do what may be dangerous. There is a great deal of difference between courage and recklessness. Courage is commendable at all times, but the great percentage of danger lies in the taking of unnecessary chances and risks. . . . These statistics which we have considered are of little value to us unless we can draw a lesson from them. The question is to what extent these casualties can be avoided. We have had no great accidents; no great calamities which have shocked the public and filled the newspapers with scare headlines. We have been going along day by day in the usual and orderly operation of a railway. But these men are dropping by the wayside through the silent but powerful grind of the little things. We do not have to wait for some great calamity to come upon us to produce this record. It is the result of the neglect of little things.

"The company can do much to promote the safety of its men by improving the general physical conditions. It has spent a great deal of money in bringing the equipment up to the highest standards, and it stands ready to join with you in still further removing any dangerous conditions, found to be existing, when practicable. But, after all, most of our accidents involve the personal element—a certain man at a certain time and place did a certain thing, or neglected to do a certain thing, which resulted in injury either to himself or to some one else. Therefore, the greatest element of safety lies in the individual. The truth of this statement is shown by our records. Here are a few cases in point: Man steps off caboose right in front of approaching train on adjoining track and is killed; another tries to kick coupler open with his foot and loses leg when cars come together; another loses arm while trying to operate lever from opposite side of car; another passes around end of car so close that when it is unexpectedly moved, he is run over; another swings off car and lands on drawhead left too close to track by someone who should have moved it to a safe distance; another steps in hot water hole carelessly left open. . . . I am not preaching the gospel of perfection. We are not dreaming of ideal conditions which could never be realized; but this is a movement of men for the greater safety of life and limb; for the protection of the home. It should appeal to the best there is in every man and secure his hearty co-operation. It is not a flash in the pan; it will not be permitted to die out. With your support and earnest co-operation it is bound to succeed."

FOREIGN RAILWAY NOTES.

The traffic of the Shantung Railway, China, continues to grow, and the gross earnings per mile in 1910 were $6,881, and as the operating expenses were only 26¾ per cent., there remained net $5,037 per mile. A large part of the net went to improvements and betterments, but even then a profit of $3.811 per mile is shown. There was an average of little more than 4 trains each way daily. The passenger traffic is light, but the freight traffic comparatively heavy, and consists largely of coal.

The Hungarian minister of finance, in submitting his estimates for the coming year to the parliament, declared that the financial condition of the state railways was unsatisfactory. The proportion of expenses to earnings was greater than in almost any other European country. When the zone tariff was introduced in 1889 the operating ratio was 54.7 per cent., but it increased until 1908, when it reached 80 per cent. Little economies would not be sufficient to remedy this frightful condition. The cost of materials and labor have increased greatly, and the rates should be advanced accordingly. The zone tariff has greatly increased travel, but it does not pay. Moreover the zone tariff worked so unequally that no less than 2,000 special rates had to be made, and the minister added: "A system which to be workable, requires 2,000 exceptions, condemns itself."

The Antung-Mukden Railway, which the Japanese have been building in Manchuria, was to have been formally opened November 3, the emperor's birthday. It takes the place of a military line which was built and used during the war. By means of it Japan has rail connection with Europe, save for the straits of Simonoseki, which separates Corea from Japan; Mukden being on the line which connects the Siberian Railway with Port Arthur. Antung is the Manchurian town opposite the Corean town of Wiju, the northern terminus of the line through Corea. The road has been constructed of standard gage, like the other lines in South Manchuria, and it is in connection with them, rather than with the Siberian Railway, that is important. Better time can be made from Europe to Japan by going through to the Russian port of Vladivostok and thence by sea, than by using the new line, and as the Russians operate the line to Vladivostok, they are not likely to favor any arrangement which will divert traffic from it. The new road is said to have cost $12,000,000.

Maintenance of Way Section.

SIX papers were entered in the contest on Construction Kinks, which closed on November 25. The collection of kinks describing the reconstruction of a narrow gage road by E. R. Lewis, division engineer of the Michigan Central, Bay City, Mich., was awarded first prize, and the collection relating to rock ballasting by W. H. Cleveland, roadmaster Atchison, Topeka & Santa Fe, Wellington, Kan., was awarded second prize by the judges, who were: D. J. Brumley, engineer of construction, Illinois Central; J. S. Robinson, division engineer, Chicago & North Western, and C. G. Delo, engineer of maintenance of way, Chicago Great Western. Other papers were submitted by G. R. Barry, assistant engineer, Pennsylvania Lines West, Cambridge City, Ind.; C. L. Van Auken, Chicago; J. W. Shikles, assistant engineer, Chicago, Burlington & Quincy, Chicago; and George Mattis, resident engineer, Oregon-Washington Railway & Navigation, Portland, Ore. These papers are all valuable and describe practical methods for the handling of different kinds of track and construction work. The contest was more than usually productive of those kinks which can be applied to the every day work of the ordinary road.

ASSUMING that the safety of operating on rails of a special composition or alloy is the same as on the common Bessemer rail, the premium a railway is justified in paying for a special kind of rail depends mainly on the extent to which its life exceeds that of the ordinary rail. While the use of special rails is still in an experimental stage, the demand is growing for a rail that will have a greater life on sharp curves in congested territory and at other points subject to heavy wear, these being points where the life of the ordinary rail is but a few months and where the cost of renewal is very expensive. A number of experiments have been made, especially by the eastern roads, and several others are now being carried on. The results secured so far do not appear to indicate that satisfactory material has been found. In most cases the increased life secured is not proportionate to the heavy increased initial cost. To get the most economical results it would be advisable to have three, or perhaps four, different kinds of rail varying in resistance to wear and in cost, to place under corresponding degrees of service so that the ultimate costs of the rails at the different locations would be approximately equal. Whenever it becomes possible to manufacture rails possessing these different degrees of resistance to wear at proportionate ratios of cost, an interesting study of economical rail distribution will be possible. For this reason the paper by Mr. Luty in this issue is especially interesting.

THE condition in which the roadbed goes into the winter this year gives the track supervisor a good opportunity to study the condition of the sub-drainage of his track, because of the fact that the heavy rains of the past two months have saturated the roadbed with water. Where the drainage is poor a large amount of this water still remains in the subgrade, and the freezing of this water will result in more than the usual amount of heaving. The present conditions are very similar to those existing two years ago when heaving was very prevalent and slow orders were necessary in many places until the track could be properly shimmed. While it is probably impossible entirely to avoid heaving of track, there is no question that a large part of the trouble resulting from this cause is unnecessary. There is no longer any doubt about the economy of drainage, but many men do not yet realize the importance of thorough drainage as affecting the condition of the track both in winter and summer. Shimming is but a temporary expedient. In addition to the loss of time and labor, the use of shims is objectionable because it increases the danger of spreading track, owing to the decreased penetration of the spike into the tie. For this reason heavy shimming of track requires careful bracing of the rails, especially on curves, as well as more careful inspection. While nothing can be done now except to put in shims as the track heaves, this heaving will indicate very prominently where remedial work is necessary. Careful note of all such places made by marking the rail or keeping other records will prove valuable next spring when proper measures can be applied to eliminate future trouble.

THE discussion of different methods of protecting timber bridges against fire, appearing on another page, is, it is believed, of timely value to master carpenters and bridge supervisors. The interest taken in this subject is illustrated by the fact that a committee report on it was presented at the recent annual convention of the American Railway Bridge and Building Association, while another report on this same subject will be presented at the annual meeting of the American Railway Engineering Association. The Association of Operating Officers of the Chicago & North Western considered this subject at its last spring meeting, while a similar association of the Missouri, Kansas & Texas considered it very recently. While a few roads have provided some form of protection against fire for their timber bridges for a number of years, the attention given to this subject has received a great impetus since the passage of the recent federal regulations regarding the dumping of locomotive ash pans. While these regulations may have decreased the number of accidents to firemen, they have very materially increased the danger of fire losses, and thereby rendered necessary increased supervision on the part of the master carpenter or bridge supervisor. Although the rapid increase in the use of concrete within the past few years has resulted in the replacing of many timber structures with those of permanent construction, there are many bridges which will not be rebuilt in permanent form for many years. The difference in the ultimate costs of small timber and concrete or steel bridges is not as greatly in favor of the permanent construction as is generally supposed, and in many cases a permanent structure is only justified when other considerations than economy enter into the decision. Since these timber bridges will remain in service for many years it is necessary to effectively safeguard them against fire in order to maintain continuous operation.

PROBABLY in no recent year has as much attention been given to efficiency in maintenance work as in that now closing. Increased operating expenses have made necessary strict economy in all departments and the track and bridge departments have been required to do their share in this work. It was fortunate that the amount of work to be done by maintenance forces was smaller this year than in the years immediately preceding, for this gave opportunity for closer attention to the handling of the work under way. There is a great field for improvement in the organization of floating gangs, and several roads have made marked changes in this line with very beneficial results. Another field for improvement is in the use of new tools or equipment to aid in different classes of work. Rail-laying cars, which have been first used to any extent this season, are an example of this sort. Methods of creating rivalry among those engaged in maintenance work, and thereby increasing their interest, illustrates another field to which more attention has been paid. The contracting of work, which has been referred to in these columns, has been more widely adopted on certain roads. The above are examples of the many different lines in which beneficial results have been secured from improvements made this year. We are

particularly desirous of drawing out a large number of descriptions of improvements which may indicate that progress is being made in maintenance work. It is not necessary that a plan be original, but if it was first used there this year and good results were secured, a statement of these facts may be of assistance to others. A prize of $25 will be paid for the best article describing such improvement, while $15 will be paid for the second best article. We will pay our regular space rates for all other contributions accepted for publication. All papers should be in the hands of the civil engineering editor of the *Railway Age Gazette*, 417 South Dearborn Street, Chicago, not later than December 25.

THE contest on Track Kinks, which was conducted by us last June, was so successful and brought out a number of devices of such practical value, that several have asked that we conduct another contest on the same lines. We are glad, therefore, to announce a contest on Track Kinks to close on January 25. As there has appeared to be a question on the part of some regarding what a track kink is, we repeat a definition of a kink which has been given elsewhere, viz., that it is a new or novel method, device, or means, by which a saving of time, labor or material can be effected. In the consideration of whether a kink is new, the position of the majority of the track men is borne in mind. Even if a device has been used locally for a number of years, it is still a kink if it is new to most experienced men. Contributions will be welcomed describing any kink used in general track work, while those dealing with the winter problems, such as the handling of snow and ice in terminals and at switches, will be especially timely. If our readers realized the value that the kinks they are commonly using may have to other men they would promptly send them in. One kink brought out in the last track kink contest resulted in a saving of two men in each of the several floating gangs for the entire season on one division of a certain railway. These kinks exist in large numbers, as we find in traveling throughout the country, and if anyone engaged in track work will give this subject a little thought he will probably find several short cuts in use on his own work which come within this classification. These kinks, perhaps contrary to general opinion, are to be found on unimportant branches as well as on the more important main lines; in fact, many times the lack of facilities gives rise to valuable devices which might never have been thought of had plenty of money and equipment been available. Contributors are urged to send in collections of several kinks, and while the judges will award the prizes on the best individual kinks, all others suitable will be published and paid for. Prizes of $25 and $15 will be awarded the two best contributions, and we will pay our regular space rates, with a minimum rate of $3 for a collection, for all others accepted for publication. All contributions must be in the hands of the civil engineering editor of the *Railway Age Gazette*, 417 South Dearborn street, Chicago, not later than January 25.

THE TURNOUT

THE article on the Turnout, by Mr. Stevens, in this issue, is an instructive and valuable discussion of this important problem of track construction. The writer treats the subject from both the theoretical and the practical standpoints, and points out wherein theoretical have had to compromise with practical considerations in the problems of manufacture and operation. While the turnout as a whole is an old device possible of little radical change, the various details of construction of the constituent parts are continually undergoing readjustment to meet the increasing requirements placed upon it. Because of these readjustments there are several comparatively minor differences in the practices of various prominent roads, in many cases depending largely upon the personal ideas and experiences of those in charge of maintenance standards. Mr. Stevens has assumed a well advanced, but at the same time conservative, in other words, a conservatively progressive, position in line with the best practice, and the paper is especially valuable for this reason.

The turnout has undergone considerable development within the past few years. With the increase in multiple main tracks and the necessity for diverting trains from one track to another under relatively high speed, the service demanded of main line turnouts has changed. While the general tendency has been to increase their length in yards and other places where speed is not a consideration, in order to keep pace with the increase in the rigid wheel bass of the locomotive, the increase here has not been in proportion to the increase in the length of main line turnouts where high speed has been the important consideration. The conclusion reached by Mr. Stevens—that any frog of less angle than a No. 15 is unnecessary, inasmuch as it does not appear practicable at the present time to reduce the switch angle much below 1 deg.—brings up a question of very live interest. Here the practice on railways differs. Many engineers will agree with the writer in his conclusion. On the other hand, the fact that many roads use No. 20 turnouts for main line movements is a strong indication that they regard them more favorably than No. 15 turnouts. With the type of construction of both frogs and switchpoints now in use, the angle at the switchpoint is to a large extent the governing feature in determining the riding qualities of a turnout, and it would seem that any considerable decrease in the curvature below that through the switchpoint would be unnecessary. However, this comparatively sharp curvature at the point extends but a few feet and the flatter frog is at least on the side of easy riding track. The practice on the Pennsylvania Railroad is to use No. 20 frogs, with 30-ft. switchpoints at such cross-overs. Another large road is considering seriously the preparation of new standards adding to the length of all yard and main line turnouts. With the increasing attention being given to this subject, and the continually growing demand for high speed passenger movements, the time should not be far distant when the process of manufacture will enable the switch angle to be reduced and the degree of curvature to be correspondingly decreased.

Another point discussed by Mr. Stevens, about which there is some difference of opinion, is that of bolting the heel blocks through both the switch and the stock rails. As the writer says, the advantages to be gained by the use of heel blocks are generally recognized, but their use is not so widespread as might reasonably be expected. Recently several roads have ceased bolting these blocks through the main rail and have simply passed the bolts through the heel block and switch rails, this being due to the stresses developed in these bolts and the tendency of the main line rails to buckle as a result of creeping. The photograph shown in the *Railway Age Gazette* of July 21, page 126, in the discussion on rail anchors, clearly illustrates this difficulty.

PROPER LENGTH OF SUPERVISOR'S TERRITORY.

IN common with most departments of railway operation, a great many men consider that the track department is over-manned, and that its being over-manned is chiefly because it is under-officered. It is a question whether the proper amount of track to be placed under the supervision of one roadmaster or supervisor is being given as careful consideration as it deserves by operating men. On many roads little or no change has been made in the territory of supervisors for many years, although the amount of track, including multiple main tracks, as well as yard and sidetracks, has greatly increased, and the burden of traffic on these tracks has increased in an even greater ratio, requiring the standards of maintenance to be greatly raised. Many lines which were comparatively unimportant branches years ago are now carrying heavy traffic, and not a few have been double-tracked without any corresponding decrease in the territory of the supervisor. In addition to the increase in the regular section forces which must keep pace with the development of traffic, the number of extra, or floating, gangs in the summer is greatly increased, to handle rail and ballast renewal, ditching and sim-

ilar work. A track which as a branch line very seldom required a special gang now has to be almost completely renewed every few years by forces other than section men who are busy with their routine duties. While it is true that a more frequent train movement allows a supervisor to get over his territory more easily, this advantage practically ceases to increase after the train service exceeds four or five trains each way.

The efficiency of the track forces depends to a large extent upon the personal supervision and instruction which the roadmaster or supervisor is able to give them. The task put on the foremen now is greater than it was a decade ago, owing, for one reason, to the very large percentage of laborers in the gangs who are ignorant both of the language and of the work, while the foremen themselves, as a class, are not of the same high standard as those of a few years ago. The number of men employed on a single supervisor's territory today frequently exceeds by several times the number employed on the entire division a few years ago. As an example, the average expenditure for maintenance on one division of 700 miles of an eastern railway exceeds four and a half million dollars annually. It is impossible for a roadmaster properly to supervise the work of from 30 to 40 extra gangs scattered over 150 to 175 miles of line, in addition to perhaps 40 section gangs. To get the best results he should be able to spend enough time with each foreman to know that he is handling his gang to the best advantage and securing maximum results. The salaries of the roadmasters bear such a small ratio to the total cost of the track labor under their supervision that a material increase in their number would hardly appreciably affect the total expense of track work; and the better results secured by closer supervision should offset many times over the additional salaries.

The Pennsylvania Railroad has gone into the subject of maintenance of way organization thoroughly, and its conclusions should be instructive. On the busy four-track main lines the territory of a supervisor frequently does not exceed 25 miles of line, while the average for the entire system east of Pittsburgh is about 58 miles of line, or about 92 miles of main track. In addition, each supervisor is provided with an assistant who relieves his superior of a large amount of detailed work, and at the same time is developing into material for a supervisor himself. On the other hand, the average practice on the western roads is to assign to each roadmaster from 150 to 200 miles of main line, and even more on light traffic branch lines, without allowing him an assistant.

In the study of the proper amount of territory to be given to the roadmaster, it should be borne in mind that he should be provided with sufficient clerical help. While any increase in clerical forces is generally opposed, there is no economy in requiring a roadmaster to spend his time writing letters in longhand or attending to the many details of the office which could be handled equally well by a competent clerk. The office work requiring his personal attention should be reduced to a minimum, and he should not be required to work at his desk late at night on routine matters. When he has a daily pay roll of several hundred dollars under his supervision he should be expected to spend his time with the gang in order to see that proper results are secured from this large expenditure.

Very little has been said about the traffic through the Simplon tunnel since it was opened, but the report of the Italian state railways gives the quantity of freight which enters and leaves the country at each border station, and from this it appears that in the year ending with June, 1910, 56,335 tons of freight entered Italy, and 74,764 left it by that route, an average per day of 154 and 205 tons—which seems hardly to justify the building of a tunnel 12½ miles long. The average number of freight cars daily was 18 in and 21 out. The imports by the Mount Cenis route were nearly six times, and by the Gotthard 13 times as great; the exports by the Mount Cenis route twice, and by the Gotthard six times as great.

Letters to the Editor.

"ROLLING LOADS ON BRIDGES."

Chicago, November 23, 1911.

To the Editor of the Railway Age Gazette:

I cannot agree with the conclusions Mr. Greiner has drawn in his article on "Rolling Loads on Bridges," reprinted from Bulletin 139 of the American Railway Engineering Association, and appearing in the *Railway Age Gazette* of November 17, in which he seems to have assumed that the Cooper's E-50 loading ought to be sufficient to meet any possible further requirements and has then endeavored to demonstrate the same. In the accompanying table are given the center moments and end shears for spans up to 400 ft., for our double Santa Fe Mallet engines, our heavy grade loading, Cooper's E-60 loading, and our 1,800 class engine, these latter being the balanced compound Prairie type. This table shows that the moments and shears given by the E-60 loading are not very much in excess of those shown by our double Santa Fe Mallet engines. For the longer spans, if a train loading of 5,000 or 6,000 lbs. per foot is used, the difference between the moments in the two cases would be still less. If we compare the moments and shears produced by our Santa Fe Mallet engine with the E-50 loading, we will find a very slight excess, if any, in the latter loading.

It does not seem to me that this excess is sufficient to allow for any further probable increase in the weight of these special engines. A train of short heavy ore cars will show an equivalent uniform loading of from 5,000 to nearly 7,000 lbs. per running foot of track, so we must adhere to a sufficiently heavy uniform loading. I consider that Cooper's E-60 loading is a good deal nearer the possible maximum requirements than the E-50, and do not feel altogether certain that even this is sufficient.

A. F. ROBINSON,
Bridge Engineer, Santa Fe System.

Center Moments and End Shears.

	S. F. Mallet 3.000.		Heavy Grade Load.		E-60.		1,800 Class.	
Span.	Moment.	Shear.	Moment.	Shear.	Moment.	Shear.	Moment.	Shear.
10...	71	38	99	54	84	45	73	39
15...	156	49	223	73	191	60	134	48
20...	256	61	371	88	310	75	239	58
25...	401	74	535	99	458	85	348	65
30...	553	82	716	107	616	95	458	72
35...	704	90	898	115	785	104	575	77
40...	867	99	1,090	123	983	113	733	84
45...	1,043	109	1,304	131	1,201	123	889	90
50...	1,265	120	1,532	139	1,426	131	1,044	96
60...	1,872	141	2,058	154	1,949	147	1,395	110
70...	2,445	158	2,651	175	2,560	166	1,848	122
80...	3,100	174	3,320	196	3,241	186	2,358	134
100...	4,635	206	4,803	232	4,830	225	3,595	103
150...	9,318	267	10,112	309	10,575	313	7,687	230
175...	12,021	304	13,203	344	14,040	351	10,011	261
200...	14,956	333	16,841	378	17,775	393	13,391	291
250...	22,064	388	24,467	382	.....	...	.....	...
300...	30,452	442	32,862	449	36,612	547	27,404	354
350...	38,420	495	38,598	515	49,908	625	36,432	421
400...	*46,388	547	53,906	581	63,204	703	45,459	488
	One engine and 4,000 lb. per foot.		2 engines and 4,800 lb. per foot.		2 engines and 6,000 lb. per foot.		2 engines and 4,000 lb. per foot.	

*52,425.7 with 4,800 lb. per foot.

Chicago, November 23, 1911.

To the Editor of the Railway Age Gazette:

Like all productions of Mr. Greiner's pen, his discussion on "Rolling Loads on Bridges," appearing in the issue of the *Railway Age Gazette* of November 17, is of much interest and merits close study. In general I agree with Mr. Greiner's conclusions but the methods of computation adopted by the Harriman Lines differ somewhat from the specifications of the American Railway Engineering Association, so that the tabulated relative stresses would differ in a comparison based on our specifications.

Our specifications require all counter systems to be so designed as to take care of 80 per cent. increase of live loads, and, in view of the low unit stresses used throughout an increase of 80 per cent., without speed restrictions, would not be beyond safe practice on other members. As our present loads are

equivalent to Cooper's E-55 loading, an increase of 80 per cent. would be equivalent to practically E-100. We do not, therefore, think we will be justified at present in increasing the live loads for which our bridges are now designed At a recent conference of the engineers of the Harriman Lines this matter was fully discussed and this conclusion approved. We agree with Mr. Greiner that a 50 per cent. increase in rolling load, without speed restriction, would be safe practice on bridges designed under American Railway Engineering Association specifications, but this percentage of increase could safely be exceeded on bridges under ours.

With regard to using live load E-50 on low grade lines and E-60 on high grade lines, considering the difference in speeds, the necessity of frequently operating the heaviest rolling stock over both high and low grade lines and the advantages in cost and delivery of minimizing the number of common standards, I believe that all bridges on any given line, whether high or low grade, should be designed for the same live loads.

JOHN D. ISAACS,
Consulting Engineer, Harriman Lines.

ABSTRACT OF ENGINEERING ARTICLES SINCE NOVEMBER 17.

The following articles of special interest to engineers and maintenance of way men, and to which readers of this section may wish to refer, have appeared in the issues of the *Railway Age Gazette* since November 17:

IMPROVING RAILWAY TERMINALS AT SEATTLE.—The Municipal Plans Commission of Seattle has prepared a very elaborate report, recommending certain steps necessary to improve the city, including the building of a new union passenger station and extensive track elevation and realinement. An abstract of that part of the commission's report referring to railway improvements was given in the issue of November 24, page 1044, being written by a correspondent who has been over the ground and is thoroughly familiar with the situation.

SOO LINE CUT-OFF FROM NEW RICHMOND TO WITHROW.—The cut-off which the Soo has built to improve its Chicago division entrance to St. Paul and Minneapolis and the steel arch bridge over the St. Croix river, on this cut-off, were described December 1 on page 1091. The bridge is unique in design, combining the merits of two-hinge and three-hinge arches by the use of a special sliding joint in the top chord. This and several other novel features of design were described and illustrated.

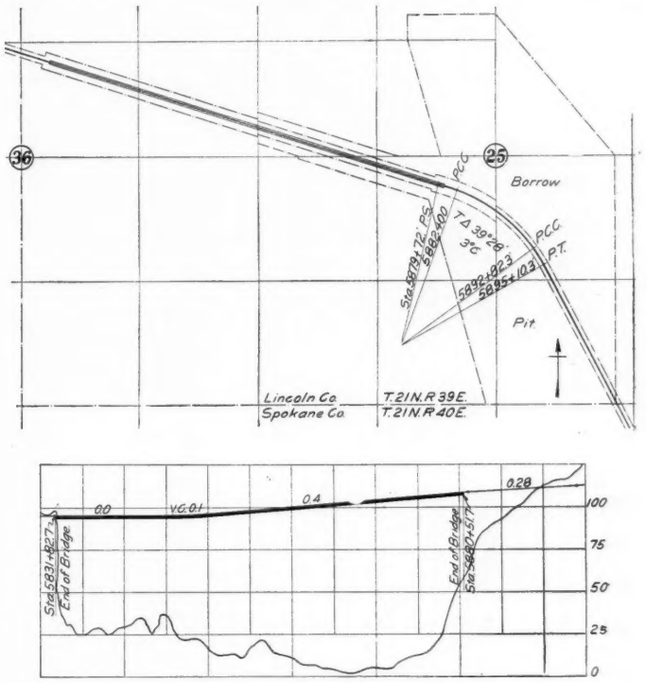
BURLINGTON'S NEW GENERAL OFFICE BUILDING.—A description of the plans for the general office building which the Burlington is now building at Jackson boulevard and Clinton street, Chicago, was given in the issue of December 8, page 1174.

A NEW METHOD OF TESTING RAILS.—An abstract of a recent article by M. C. Fremont in *Le Gemé Civil,* descriptive of a method of securing samples from rails which will give accurate tests of the quality of the rail, appeared in the issue of December 8, page 1176.

Construction work on the Jullunder-Doab Railway, India, is actively progressing. The headquarters of the company are Jollunder. The chief engineer, Mr. Bagley, has made a good economical design for the Sutlej bridge, and it is anticipated that the opening of the line to traffic will take place at an early date. The track is being laid on cast iron pot ties. During the past, these ties have proven very unsatisfactory and totally unsuited to Indian traffic conditions. It has been a common sight to see miles of track being pulled up from these ties, wherever they have been laid in India, to be relaid on wooden ties.

FILLING THE SPRAGUE GULCH TRESTLE ON THE SPOKANE, PORTLAND & SEATTLE.

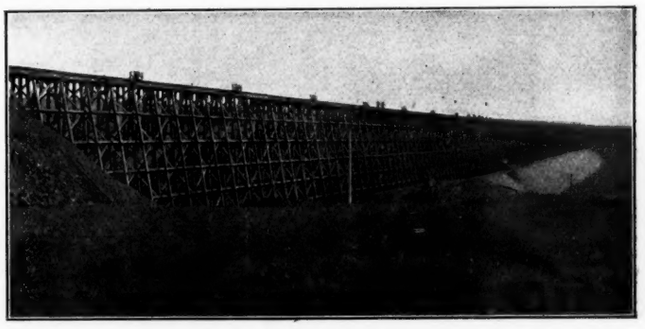
An unusually large and interesting undertaking in bridge filling is now under way at Sprague Gulch, near Lamont, Wash., about 40 miles south of Spokane, on the Spokane, Portland & Seattle. Sprague Gulch is a large ravine or waterway nearly a mile wide and extending southwest across Lincoln county. Although large quantities of water must have passed through the channel in past ages, there is no flow above the surface now, except following heavy storms. There is, however, a considerable sub-surface flow through the gravel in the bottom of the gulch at all times, coming from several lakes in the southeastern



Plan and Profile of Sprague Gulch Fill.

part of the country. These lakes only overflow in the spring, saturating the gravel at that time so that the flow is maintained throughout the year. The Northern Pacific secures water for locomotive use from this underflow at Sprague station, some distance down stream from this crossing while the contractor on this work secured his water from the same source.

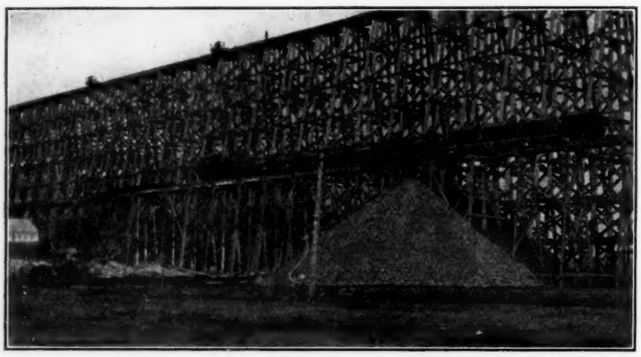
At the point where the Spokane, Portland & Seattle, or "North Bank Road," crosses Sprague Gulch, the west bank is nearly vertical, as is commonly the case in the dry country, while the east bank has a more moderate slope. When the road was built in 1907 this gulch was crossed on a framed trestle in order to expedite work, as it would have required several months to have handled the immense quantities of earth required to complete this fill. This trestle is 4,869 ft. long, with a maximum



West End of Embankment.

height from base of rail to surface of water of 101 ft., and an average height of over 75 ft. It is composed of 317 6-post bents, 56 of which rest on piles, while five more have piles under the south side. Because of its great length and height, and the fact that it is located at the foot of a long 0.4 per cent. grade rising to the east, which grade is the maximum for this line, a slow order for 20 miles per hour has been maintained across the structure since it was put in service. The track is on tangent across the bridge and for some distance west, but a 3-deg. curve starts at the east end of the structure, the easement extending 135 ft. on to the bridge.

Because of the fire risk, the necessity of maintaining a slow order and the element of danger always present when operating over a structure of this size, and also because of the fact that the renewal of certain portions of the bridge would be necessary

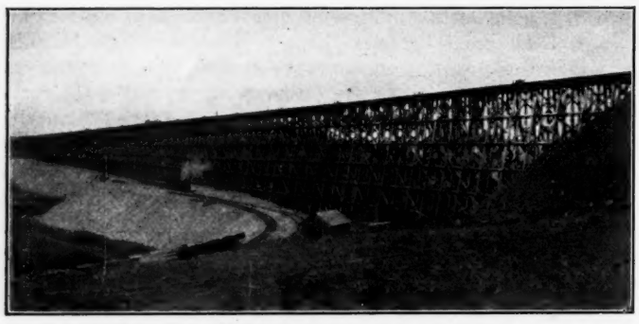


Dumping Four-Yard Cars on First Lift.

within a few years, it was decided to replace the timber trestle with permanent construction.

On account of the advantageous location of the borrow pit containing excellent material for steam shovel operation, it was found that the bridge could be filled at no greater cost than to build a steel viaduct, and it was, therefore, decided to fill the bridge.

There were three private crossings and one highway crossing under the timber trestle. These were all eliminated by a relocation of about 3,000 ft. of the highway and combining the private crossings with it, making one crossing under the track about half a mile west of the west end of the bridge. The relocation of the highway was simplified by the fact that the abandoned and the relocated highway crossings were both a school section, the title to which is still in the state of Wash-

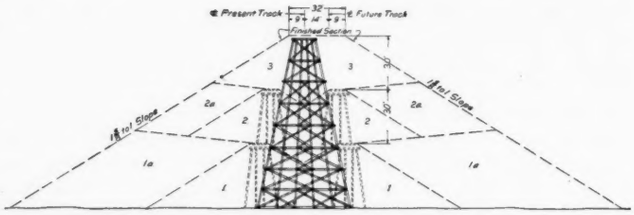


First Lift, from East End.

ington. The new undercrossing is a 14 x 14-ft. concrete box with a concrete slab top. The original location of the highway under crossing was 75 ft. below subgrade and on a sidehill, where the difference in elevation of the footings for the sidewalls would have been 20 ft. Aside from making an unsatisfactory under crossing, this location would have required a long, heavy arch which would have been very expensive to construct.

A double barrel 4-ft. x 6-ft. box was also constructed in the bottom of the gulch as a waterway opening to provide for the storm water flow as well as for some of the underflow, which will probably be partially shut off by the compression of the gravel subsoil, resulting from the heavy load of the fill above.

In planning for this work advantage was taken of the sloping bank on the east side of the gulch, and it was decided to open borrow pits on each side of the track at the levels of the vari-



Cross Section Showing Method of Building Embankment.

ous lifts, thus eliminating crossing back and forth under the trestle and avoiding all uphill haul of material. Borrow pits totaling 180 acres in area were purchased and 24 test pits dug at various points in the pit to show the material to be handled. In this way the very common uncertainty regarding the class of material to be encountered was eliminated. The material uncovered in the pit was a glacial drift and gravel with a small percentage of boulders, few of which exceeded one-half cubic yard in volume. Contractors were asked to submit bids on a flat price basis, with no allowance for overhaul or classification. Because of the very favorable natural location of the work, the certainty regarding the material to be handled, and the fact that there were very few delays from the weather in this arid locality, there was close bidding on the work and a very low price was secured.

The contractor provided two complete outfits, consisting of two 70-ton Bucyrus shovels, with eight dinkey engines and 116

Borrow Pit on East Side of Track; Sprague Gulch Fill.

4-yd. cars, to handle the work, and to comply with the specifications which required that the fills on each side of the main trestle be brought up together to avoid unequal pressures tending to force the structure out of line, it was decided to build the fill in three lifts, as shown in the accompanying drawing, the first one approximately 35 ft. high and the other two 30 ft. each. It was planned to carry these lifts across the entire length of the fill, making the first lift across the bottom of the gulch about 1,800 ft. long. However, the contractor found such good material in uncovering his first cut, that he raised his grade gradually as he extended the fill across the gulch and made a first lift entirely across the bottom. The railway company offered no objection to this change in specification, as it left more material in the upper levels of the pit which will be available for filling other bridges in the vicinity in the future.

The specifications also required that the contractor build his construction trestles as close to the main trestle as practicable,

and fill out from these so that if there should be any tendency for the ground to rise beyond the slope, it would not interfere with the alinement of the high trestle. The wisdom of this provision became evident when such a movement appeared at one point without any damage to the trestle. At this point the ground raised 5 ft. for a strip about 140 ft. long by 50 ft. wide, about two months after the work started. Since that time no further movement has been noted.

From the section shown it will be noted that different layers are sloped in slightly towards the center, so that should there be any tendency for the material in the bank to slide it will move towards the center and compact. As fast as the fill is completed as far as it can be reached from the trestle, the tracks are thrown on to the fill and banks widened out to the slope stakes before a second lift is started. When the first lift was entirely completed the shovels were moved up the slope of the borrow pit to the level of the second lift, this change causing an interruption to the work of but five hours. No trestle will be erected for the third lift, but the contractor will change to standard gage equipment and unload from the main line, working under the control of the regular railway train despatcher.

The construction of the highway under-crossing and the culvert were included in the grading contract and were sublet by the contractor to another firm. The railway company furnished all material for their construction. Specifications required that concrete in the culvert be allowed to set 30 days before being covered, and at the end of that time it was required that the culvert be covered with a 4-ft. cushion of earth before any dumping was allowed directly on it.

Up to the present time very little trouble has been experienced from the settling of the main track trestle, and none is anticipated from now on, as the larger part of the trestle is buried in the fill. The outside batter posts settled somewhat while the first lift was being built, but the openings were closed by wedges inserted on the tops of the lower batter posts. A small bridge gang has been maintained on the bridge by the railway company since the work started in order to keep the trestle in line and surface and to be on hand should any serious trouble develop. It was necessary to avoid interruption of main line traffic, as the S. P. & S. is the direct main line of the Hill system between Portland and Spokane, and it is therefore, an important passenger line. In addition to S. P. & S. trains, most of the Northern Pacific freight trains are handled over the S. P. & S. between Pasco and Spokane, on which section of the road the Sprague Gulch fill is located.

The contractors started work on March 15, and completed the first lift on August 23. Both shovels have worked day shifts only, except during the last part of September when the shovel on the east side was worked night shifts for one week in order to bring the east side filling up even with the west side, the filling on the east side having gotten behind, as the embankment is being made wide enough for a second main track on that side. The output has been maintained at a remarkably high figure since the beginning of work. Ten-hour shifts were worked until May 1, when they were lengthened to 11 hours. On June 14, 12-hour shifts were started and another shovel crew put on so that each crew works but 8 hours. On October 1 shifts were changed from 12 to 10 hours, with two shovel crews. Up to October 31, 1,116,505 cu. yds. of material had been moved. This is at the rate of 251 yds. for every hour of work, including all delays due to breakdowns and moving for both day and night shifts. It amounts to 65,200 cu. yds. every month per shovel, working single 10-hour shift, or 78,300 yds. per month per shovel when one 12-hour shift was worked. This output has been maintained for seven and one-half months, and is still being continued. The best month's output to date was 174,000 yds. moved in August with two shovels, and the best daily record was made on June 23, when 7,470 yds. were moved with both shovels in 12 hours. The contractor's force employed averages about 150 men. The total estimated amount of earth to be handled is 2,350,000 cu. yds., of which about 55 per cent. is now in place.

This work is being done under the direction of R. Budd, chief engineer of the Spokane, Portland & Seattle, and W. C. Mock, resident engineer on the work. A. D. McDougall & Sons, of Portland, Ore., are contractors on the work, with Bates & Rogers, of Spokane, Wash., sub-contractors for the concrete work.

MATHEMATICAL RELATIONS BETWEEN INCREASES IN COST AND INCREASES IN DURABILITY IN STEEL RAILS.

BY B. E. V. LUTY.

It may be granted at the outset that it is anticipating a little to figure out the mathematical relations between cost and durability of steel rails, for of course the precise relative durability of different kinds of rails is not ascertained. However, special rails have been coming rapidly to the front, and if they are bought and paid for, the economies promised or expected should be the subject of careful thought. If we regard the open-hearth as a special rail it is to be observed that last year 47 per cent. of the total production was of this description, but passing that by it is to be observed that of rails purified by titanium—commonly called "titanium rails"—there was produced last year 195,408 tons, which probably means that of all the rails used by steam roads for replacement purposes last year, more than 10 per cent. were of this description.

It is obvious that the harder the service required of the rail the better it pays to use a good one, for with hard service upon any kind of rail the depreciation charge is large in proportion to the interest charge, while with light service the reverse is the case. For instance, if the service is such that an ordinary rail will wear for 20 years, one cannot afford to pay much premium for a rail calculated to last 30 years, because the additional interest on the premium runs through all the years, whereas the annual replacement fund to be set aside to replace the higher priced rail in 30 years, as against the ordinary rail in 20 years, may not be reduced at all, and may even be increased. If, on the other hand, the service is such that the ordinary rail will last only two years, it may well pay to buy a somewhat higher priced rail which promises to last three years.

In no case can the increase in the cost of the rail be allowed to be as great as the increase in durability. Theoretically that would be permissible if the rails had no life at all, for then there would be no interest charge, just as it is theoretically as well, in buying power, to pay twice as much per cu. ft. for water under 100 lbs. pressure as for water under 50 lbs. pressure.

As the duty upon the rail decreases, making for longer life for any description of rail, it is less and less economical to buy the more durable rail, on account of the interest charge figuring more and more largely. However, the increase of freight movement in the country has been steadily decreasing the life of rails. The time was that the first cost of the rail was the prime factor, the time of ultimate wearing out being so remote that it was not seriously considered, but the density of traffic has so increased that now on thousands of miles of track rails are wearing out very fast. Using the Interstate Commerce Commission's statistics, we compute the number of ton-miles of freight per mile of railway for the entire country as follows:

1890	487,425	1905	861,396
1895	479,490	1910	1,085,745
1900	735,352		

Thus in periods of twenty years the density of traffic has easily doubled. The above comparison is necessarily inexact, because, as it is per mile of line instead of per mile of main line track, it does not take account of the increase in speeds and weight upon wheels or the condensation upon certain trunk lines of enormous volumes of traffic. Consideration of all these factors would show that upon the most used track the duty upon the rails has

been increasing much more rapidly than doubling every twenty years, and making the question of durability, in proportion to first cost, more and more important as regards a large mileage of track.

A mathematical basis for comparing the values of different rails under different conditions of traffic and consequent wear can easily be reached. The feature of safety cannot of course be considered. The duty placed upon the rail may be expressed by the number of years which an ordinary rail would last in the circumstances, and the serviceability of a special rail may then be expressed by a ratio made by dividing its life in the circumstances by the life of an ordinary rail. The cost of rails may be taken as the cost of the rail actually laid, minus the salvage on the rail replaced. It is unnecessary to set up sinking funds, the assumption that a proportion of the rails must be replaced each year being the most correct and at the same time the simplest. Then let

P = cost of ordinary rail
L = life of ordinary rail in years
p = the ratio of increased cost of any special rail
l = the ratio of increased life of such special rail
Interest rate, 6 per cent.

The annual cost of maintaining the ordinary rail will be—

$$.06\ P + \frac{P}{L}$$

The annual cost of maintaining the special rail will be—

$$.06\ Pp + \frac{Pp}{Ll}$$

Equating these to each other, to find the common basis on which the rails meet, and dividing through by P we have—

$$.06 + \frac{1}{L} = .06\ p + \frac{p}{Ll}$$

$$p = \frac{.06 + \frac{1}{L}}{.06 + \frac{1}{Ll}} = \frac{.06L + 1}{L} \times \frac{Ll}{.06\ Ll + 1} = \frac{l\ (1 + .06L)}{1 + .06\ Ll}$$

The last expression is in such form that one can conveniently assign any suitable value to l and then solve the equation for successive values of L, obtaining the corresponding values of p. Thus let $l = 1.25$, meaning that the special rail under consideration will last 25 per cent. longer than the ordinary rail. Then if $L = 10$, i. e., an ordinary rail in the conditions of service would last 10 years, the special rail would last 12½ years, and the equation shows that p is 1.14, i. e., the special rail can cost 14 per cent. more than an ordinary rail and give the same economic result in track. This does not mean, of course, that the rail can cost 14 per cent. more per ton at mill, for there is freight and cost of laying to be added, and there is also the value of the old rail to be deducted, perhaps the same for the special as the ordinary rail, perhaps more. A moment's reflection will show that this is as it should be. The freight and cost of laying are the same for all qualities of rail, and if the salvage is also the same then these items have nothing to do with the rail, any more than if they were items involved in another part of the track. The 14 per cent. is merely to be applied to the cost of the ordinary rail, after freight and cost of laying has been added and salvage has been deducted, unless the salvage should by experience be found to be greater in the case of the special rail. As old rails must be sold for what they will bring, an increased salvage, such as might perhaps be claimed from the presence of a large percentage of nickel, could only be expected when the scrap market is educated up to the point of paying it.

Proceeding in this manner, the following table has been computed. The first column shows the values of p for various conditions of service, assuming that the special rail will last 25 per cent. longer than the ordinary rail. If the service is heavy and the ordinary rail would last only two years, then the net cost of a rail promising to last 25 per cent. longer, or 2½ years, may be 22 per cent. greater than the net cost of the ordinary rail; for conditions of traffic permitting the ordinary rail to last 20 years the special rail can have a net cost only 10 per cent. greater than that of the ordinary rail. In the next column a similar series of values of p is worked out on the assumption that the special rail will last 50 per cent. longer than the ordinary rail, the next column giving values for an increase of 75 per cent. in the life, while the last column gives values in case the special rail has twice the durability of the ordinary rail.

Permissible Ratio of Increased Cost Corresponding to Various Ratios of Increased Durability.

Life of Ordinary Rail, Years.	Ratios of Increased Life.			
	1.25	1.50	1.75	2.00
2	1.22	1.42	1.62	1.81
4	1.19	1.36	1.53	1.67
6	1.17	1.32	1.46	1.58
8	1.16	1.29	1.41	1.51
10	1.14	1.26	1.37	1.45
12	1.13	1.24	1.33	1.41
14	1.12	1.22	1.30	1.37
16	1.11	1.20	1.28	1.34
18	1.11	1.19	1.26	1.32
20	1.10	1.18	1.25	1.30

It will be observed that in all cases the permissible increase in net cost decreases rapidly as the life is increased. In each column the series really starts at zero years, the successive decrements for each two years growing smaller and smaller, so that if the rails did not last at all the net increase in cost could equal the increase in service, while on the other hand if the ordinary rail lasted an indefinitely long time, it would not be economical to pay any more for the more durable rail, no matter how much more durable it might be, for in an indefinitely long series of years all the values of p would decrease to unity.

A glance at the values will show that for any condition of service whereby the ordinary rail would last, let us say, about 10 years, there is little economy in using the more durable rail. Assume the net cost of the ordinary rail, plus freight and cost of laying and less salvage, to be $20, which is not very far from the average, than if the ordinary rail lasts 10 years the net cost of the special rail, if promising double the life, or 20 years, can only be 45 per cent. greater, or $9 more, say $37 per ton at mill instead of $28. If on the other hand the conditions of service are such that the ordinary rail would wear out in four years, it would be feasible to pay 67 per cent. more on the net cost, or $13.40, making the cost per ton at mill $41.40 against $28.

In the same manner a special rail promising 50 per cent. longer life can cost a premium per ton of $7.20 if for service wearing out an ordinary rail in four years, $5.80 in the case of eight years, $4.80 in the case of 12 years, $4 in the case of 16 years, and $3.60 in the case of 20 years.

ECONOMY IN THE USE OF LARGE DUMP CARS.

That there is material economy in the use of large dump cars over small ones can be shown by the following comparison between 6-yd. and 12-yd. cars. The average working load of the 6-yd. car is 5 cu. yds. The average working load of the 12-yd. dump car is 12 cu. yds. A train of 20 6-yd. cars will haul 100 cu. yds. A train of 10 12-yd. cars will haul 120 cu. yds. However, a locomotive that can haul 10 12-yd. cars out of the pit cannot haul more than 15 6-yd. cars, on account of the high train resistance and the limiting load on the draft rigging of the smaller cars. A train of 6-yd. cars hauled by one engine, therefore, will take out only 75 cu. yds., while the same engine with 12-yd. cars will take out 120 cu. yds., or a gain of 60 per cent. It should not require more men more time to dump and right a train of 12-yd. cars than a train of 12 of 6-yd. cars, effecting a saving of probably 50 per cent. in time and labor at the dump.

FIRST PRIZE—A COLLECTION OF CONSTRUCTION KINKS.

BY E. R. LEWIS,

Division Engineer, Michigan Central, Bay City, Mich.

The more extensive undertakings in railway construction do not always demand the greatest ingenuity from the engineer in charge. More often the smaller project, presenting a wide range of obstacles to be surmounted with the least expenditure for labor and no expenditure for special equipment, more severely taxes his ability.

Such was the viewpoint of the writer when put in charge of standardizing the gage and extending a narrow gage mining railway to meet the necessities of a fast developing country. The track, which was of 3-ft. gage, was built on a roadbed 12 ft. in width, and extended from a mine, located at a considerable altitude, nine miles to a smelter on the shore of an inland lake, which in turn was connected with the Great Lakes by a ship canal constructed and maintained by the mine owners.

This narrow gage track was to be removed and the roadbed widened to accommodate a standard gage road. The road was also to be extended from the mine to a city 30 miles distant, where connections were to be made with two foreign railway lines. Difficulties in obtaining these connections compelled the promoters to force an entrance into the city by constructing the extension from the lake to the city limits instead of building from the city's railway terminals to the mine.

It was necessary, therefore, to send the rails, fastenings, ties and switch materials, as well as a light locomotive and a number of flat cars, by water to the terminus of the line on the shore of the lake.

ORGANIZATION.

When these materials had been landed, with some difficulty, and the writer had finished the railway location toward the city he was required to fit out an expedition to carry a construction gang by water, a distance of some sixty miles to the lake terminus. On this vessel the camp outfit, tools and materials not already on the ground, sufficient for three months' work of the gang of 75 men, were also to be carried. A blacksmith was to be engaged and outfitted, and two train crews were to be taken along, in addition to a competent foreman, an assistant foreman, a carpenter, a cook and an assistant cook.

Any engineer who has had experience in outfitting a survey party without more assistance than the storekeeper's clerk will give him will readily appreciate the situation. Any purchase overlooked means much inconvenience and probable expense. Tools, provisions and materials must be properly selected as to quantity and quality and properly packed, labelled and stored. Laborers must be hired and put aboard at the right time to assure keeping them.

The flotilla was towed over a choppy sea, in sleety weather, on an inky black night in April, to the scene of operations. The first three snowy days were spent in erecting camps, equipping the blacksmith shop and in rigging an old narrow gage locomotive to supply power to a winch with which to land materials and supplies from the boats. Laborers were divided into gangs of 15 each, with a large tent and a chosen leader, who served as boss of the sleeping quarters and as a grievance committee reporting to the foreman. There was no "officers' mess" and no separate table for foremen or artisans. The officers, foremen, artisans and trainment were distributed among the laborers at the table, all eating the same food, with the best disciplinary results.

Efforts were made to keep every man busy on rainy days. The money spent in wages for rainy day work was considered well spent if only to keep the men from idleness.

USING SNOW PLOW TO WIDEN BANKS.

The first construction problems were the removal of the narrow gage track and the widening of the roadbed. A large part of the roadbed was on embankment, while the few cuts had been made into virtual embankments by the removal of material for borrow and for ballast. It was decided, therefore, to combine the work of taking up the track and that of widening banks into one of operation. An old snow plow was fitted with stop flanges and extension wings. A wire cable, 200 ft. long, was attached to the plow, which was loaded on the front flat car of the narrow gage train and pushed up the grade to the mine. The plow was there unloaded on the grade facing the train. After six or seven rail lengths of track had been taken up and loaded, the cable was attached by means of a knotted rope to the drawbar of the front flat car. The locomotive was then backed down the grade, pulling the plow over the sandy banks, lowering them a foot and thereby widening them 3 ft. With the plow properly weighted, the work was quickly done. When some obstacle was struck the rope broke, without damage to plow or train. This kink worked remarkably well.

TRACK LAYING MACHINE.

The narrow gage track rails were loaded on flat cars supplied with steel rollers fitted in rows in the floors on each side of each car. These floors were later transferred to standard gage trucks and formed part of a home made track laying machine to lay the standard gage track. A narrow gage push car track was also laid over the whole standard gage train, terminating at the end of the pioneer car in an incline with upturned rail ends to catch and hold the car while its load of ties was dumped. This load of ties, sufficient for two rail lengths of track, was dumped and spaced ahead of the pioneer car, while two pairs of rails, spliced together, were passed forward over the rollers to the iron gang, which laid and quarter-spiked them.

CENTER DUMP BALLAST CARS.

Ballasting was a more serious problem, for, on account of the narrow embankments, the ballast had to be distributed between the rails. The ballast was trapped from the largest of three gravel cuts by building substantial bridges of poles and crossing planks, the only material available, from points on the cut slopes on each side of the cut, 8 ft. above the rail to a point which nicely cleared the cars. These bridges were connected by a platform over the track which contained the trap. This platform was hinged and was counterbalanced by weights and pulleys so that it could be lifted to let the locomotive through.

In order to distribute the ballast between the rails the floor of each flat car was sawed out between the center sills for about 3½ ft. in two places between the center of the car and each truck. Over these holes were placed bottomless boxes 4 ft. high, with projecting handles. When the cars had been loaded and hauled to place the boxes were lifted and the ballast distributed through the holes in the car floors. Although the loads hauled were small and the work tedious, as compared with that possible with convertible ballast cars of today, the ballast was put in at a low cost and without any waste over the sides of embankments. All of these schemes were made necessary, of course, by lack of equipment. The mechanical work was done wholly by unskilled labor, with the exception of the blacksmith and a ship's carpenter.

PRELIMINARY DRAINAGE.

A considerable portion of the 30-mile extension was through very wet cedar swamps. The contracts were first let for clearing, grubbing and ditching only. Ditching meant the excavation of a waterway, 2 ft. wide on the bottom, with 1 to 1 slopes and an average depth of 2 ft., within 10 ft. of each right-of-way boundary and parallel to the center line of the road.

Outlets were excavated, when necessary, at right angles to the line of road for final disposal of the drainage into streams or lakes. The grading contracts for each mile were let only after the clearing, grubbing and ditching were completed. Evaporation, together with this adequate and permanent drainage, dried the swamps by the time grading was started, so that the usual difficulties were almost entirely eliminated, while the labor of maintenance was minimized for all time.

SECOND PRIZE—KINKS IN ROCK BALLAST WORK.

BY W. H. CLEVELAND,

Roadmaster, Atchison, Topeka & Santa Fe, Wellington, Kan.

We have recently completed ballasting 50 miles of main track between Wellington, Kan., and Waynoka, Okla., with crushed rock. We began ballasting at the east end of the 50-mile stretch and worked west. As the train passes over the finished track it reaches the finishing gang first, then the gangs making the first raise, and then the gang that is skeletoning the track ready for ballast. The conductor of the ballast train is instructed to stop at each gang as he reaches it and let the foreman unload what ballast he needs for the day. This gives the finishing gangs the ballast they want first, and the gangs making the first lift what they want next. The train then passes on to the front and the gang skeletoning finishes unloading the remainder of the train. This arrangement allows the ballast train a straight run even in unloading, and permits a quick return trip.

Center dump cars and a Rodgers ballast plow are used. The ballast plow is always kept next to the way car when unloading. We begin unloading by opening the head car and moving the train head, opening each car in succession as is necessary. By beginning to unload from the head end of the train, we avoid pulling empty cars through the unloaded ballast and avoid the liability of derailing empty cars on account of ballast on the rail.

After the train is unloaded, the ballast plow is left at the first siding east of the uncompleted work, to be picked up by the next ballast train and taken to the front. The average cost of unloading ballast in this manner, for the time actually consumed in unloading, is six cents per car, or 1½ mills per cubic yard.

BANK WIDENING.

We are using a steam shovel and Western air dump cars in widening embankments on heavy fills, and an American ditcher with a Lidgerwood unloader and flat cars for light fills. The dirt is secured from widening small cuts, close to the fills, because of the short haul and also because the widening of cuts is a betterment to the roadbed. We are using a Mann McCann spreader to spread the dirt, and to shape up the embankments and cuts ready to receive ballast.

DITCHING WITH A SPREADER.

In cuts where the bottom of the ditch is below grade next to the track and the back of the ditch is high because of an accumulation of dirt which has washed or fallen in from a crumbling embankment, we use the spreader to shape the ditch bottom. We lower the point of the spreader wings to the proper depth and angle, and carry the wings high at the ends of the ties. The spreader is backed through the cut, which moves the dirt from the back of the ditch and leaves it at the ends of the ties. After passing through the cut in this manner, the wings are dropped down at the ends of the ties and adjusted to the required slope for the ditch bottom. The spreader is then moved forward through the cut, and the dirt is spread evenly from the ends of the ties over the entire bottom of the ditch to the slope desired. Any surplus dirt is left in a straight pile, at the back line of the ditch, divided from the ditch line in such a manner that it can be readily picked up with shovels without disturbing the ditch. This does away with the flat spots and holes in ditch bottoms, so noticeable in ditches that are made by laborers with shovels, and at much less expense.

SKELETONING TRACK.

We use extra gangs of 50 working men each, with one foreman and one assistant foreman. The skeletoning gang in the front skeletons the track, renews the shoulders of fills, prepares the cuts to receive ballast, renews ties and unloads the ballast for the first lift. This gang digs out the dirt from between the ties, sloping it gently from the center of the track to the ends of the ties, and casting the dirt on the shoulder of the fill at the ends of the ties. If there are any flat or washed places in the shoulder of fills, they are cast full and tamped solidly. When a good stretch of track is prepared in this manner the work engine runs the spreader over it with the wings adjusted to a slope of 1 in. in 8 in. This leaves the shoulder an open slope from the bottom of the ties to the outer edge of the shoulder of the fill and puts all the surplus dirt over the shoulder on the outer slope. Thirty minutes of actual working time, with a work train and spreader, will put one mile of embankment in perfect condition.

This skeletoning gang also renews the decayed ties after the track is skeletoned and before the ballast is unloaded, doing the work very cheaply at this time as the ties can be easily inspected and renewed without the necessity of digging out or shifting material. This gang also unloads the ballast for the first lift at an expense of four cents per car, or 1 mill per cubic yard.

FIRST RAISE ON BALLAST.

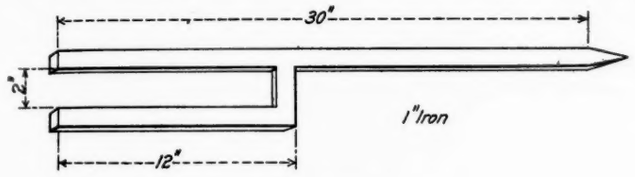
As we are putting in from 10 to 12 in. of ballast we are making two lifts of it. The gangs making the first lift follow the skeletoning gangs as closely as possible and do shovel tamping only. They raise the track up to within 1½ in. of grade, and shovel tamp the ends of the ties, and well under the rail from the outside, but do no tamping inside the rail. They space the ties to standard and renew any bad ties that may have been overlooked by the gang ahead. They line out the swings, leaving the track in fair line. When the ballast train reaches them, they open the center dump cars and fill the center under the ties and as much above the ties as the train will pass over. The pressure of the ballast plow will compress the ballast enough to insure that the centers are well filled and sufficiently tamped for the first lift, and will leave enough ballast between and on top of the ties for tamping the final lift. In this way the tamping of centers on the first lift, and also the labor of casting the ballast from the outside shoulder into the center, are done away with. All ballast has been handled by center dump cars and ballast plow, and it has not been necessary to handle any by hand. This track is left in service in this condition under heavy traffic for a few days, before the finishing lifting gangs reach it, and becomes solid under the ties by the compression of the traffic. When the finishing gangs reach it, it has settled enough so that the final lift can be permanently maintained.

FINAL LIFT.

The final lift gangs do all pick tamping and finish and dress the track complete. By the time the finishing gangs reach the work it is then about 3½ in. below grade, having compressed about 2 in. from service. The finishing gangs lift the track ½ in., making approximately a 4-in. raise, which will consume about what ballast was left in track by the high ballast plow in the last drop made by the first lift gangs. They will pick tamp the ends of the ties, and well under the rail, but will not do any center tamping between the rails, except to tamp the joint ties inside of the rail for a distance of about 18 in. They will let the traffic pass over the work with only the ends tamped, which will in a measure overcome the cause of center bound track, and will also show up any low spots that result from uneven pick tamping. Then, before tamping the centers of the ties, a small spotting gang is run ahead of the center tampers to pick up low joints that may have shown up, and retamp the ends of the ties of such spots before the centers are tamped. The center tampers follow up and pick tamp the centers. The finishing gangs will not unload any ballast until the track is in perfect surface and line ready to finish the shoulder dressing, but will then stop the ballast train and unload what is needed to complete the dressing. In this way all ballast is unloaded, handled and tamped without it being necessary to cast it with forks or shovels either to fill in centers or to relieve the track of ballast, except what the ballast plow leaves on top of the ties at the last, which necessarily must be shoveled out to clean the ballast from the top of the ties. This system also insures a good settled bed of new lift of ballast, which will maintain the surface and alinement of track when finished and will eliminate in a great measure the cause of center bound track.

TOOLS.

Our surfacing gangs are equipped with the necessary standard tools for surfacing track and with other devices that will systemize and save labor and time. For spacing ties, we furnish gangs with wooden mauls made of hard wood timber, 6 in. in diameter and 10 in. long with an iron band ring on each end set back from the face of maul. Ties can be given as many blows as desired with these mauls without bruising the timber



Spot Board Bracket.

in the least. Gangs are also furnished spot boards and blocks and two bracket stakes, a device made for holding the spot boards in position while working. These bracket stakes are made of 1 in. square iron, 30 in. long, with a bracket 12 in. deep at the top and with a space for receiving the spot board, as shown in the accompanying sketch.

One of these stakes is used on each side of the track driven down to the proper depth to retain the spot board to the desired grade position, conforming to the engineer's stakes. The spot board resting in these bracket stakes can be lifted from the brackets at any time for the passage of trains without disturbing the position of the bracket stakes, and can be replaced to the same position in the bracket stakes immediately after the passage of the train. In using the bracket stakes it is necessary for engineers to set grade stakes only on one side, for the first lift work, as stakes on one side of track are sufficient, by using the bracket stake for supporting the spot board on the opposite side of the track.

ORGANIZATION OF GANGS AND SYSTEMIZING OF WORK.

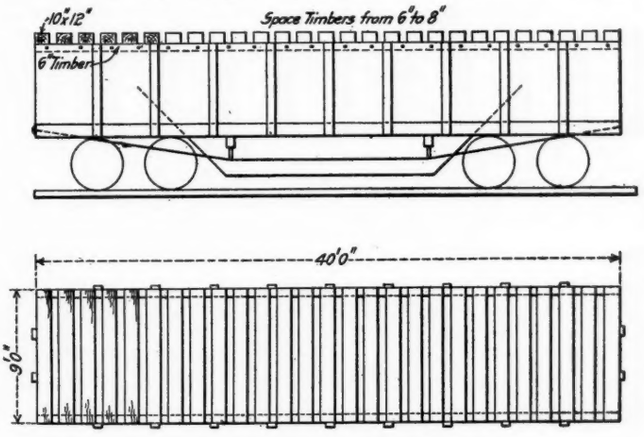
When the average foreman is handling 50 or more men, there is much confusion and loss of time because of lack of organization for lifting and tamping track and spacing and renewing ties. Each day there is the same succession of blunders, with men standing waiting for something to do and others wandering about not knowing where to begin or what to do. I have noticed some foremen making heavy lifts and raising track with from two to four jacks. This is wrong. No foreman can get 50 men busy quickly and keep them properly scattered out to secure true surface for track when using two or four jacks. In making heavy lifts of 10 or 12 in. with the ties buried in the ballast, one jack must be kept in the swing ahead of the face jack, about half the way up to face, to relieve the jack that is in full lift of the weight ahead, or the open loose track behind. The face jack will spring up from the excessive weight ahead and ruin the true surface of the track. Our gangs are organized and the work systemized in this manner, which I find gives the most satisfactory results. Each gang is furnished with six No. 6 Barrett track jacks, which will lift the track to the required face at one lift without resetting the jacks. The holes for the jack seats are opened out at the joints and centers for one day's work ahead, ready to receive the jack. Six jacks are used, three on each side of the track, with four sets of jack men, two sets working on each side of the track. When the work is started all the jacks are set in for a lift and are run part way up to face and the two front jacks are left in the swing at half lift to relieve the face jacks from the weight ahead. The gang is divided up, half on each side, and started tamping, following the jacks. When the first jack men have tamped the joint or jack tie solidly, they release their jack, take it ahead and place it in the seat ahead of the swing jack, and run it up to half lift. They leave it in the swing, step back to the former swing jack and run it up to full face lift, and tamp up the jack ties as before. The second jack men in their turn set their jacks in the seat ahead of the swing jack, and continue in this system. This will string out the gang quickly and will keep the track continually coming up to face in a systematic manner and with all men working in a well defined system without confusion. The tampers should all work on end tamping only, except to brace the joint ties, inside of the rail, and the foreman will have only one class of work to watch. When first starting to work, as soon as the first jacks are raised to face, four men step in with the wooden mauls and space the ties; and they should continue spacing until far enough ahead that two men can do the spacing, when two men fall back to tamping. In tamping first lift work with shovels, let the men work two together on the same tie, one on each side of the tie, and turn the shovels over, using the shovel blade reverse side up. The men should deliver a pushing blow at the same time and directly opposite each other, so that the force of their blows meet. This will carry the ballast under the tie and will fill under the tie quickly and solidly. Finishing gangs work under the same system when surfacing, except that they do all pick tamping work and finish completely.

SCREENING LARGE BOULDERS FROM BALLAST.

BY GEO. MATTIS,
Resident Engineer, O.-W. R. & N., Portland, Ore.

Very often during new railway construction where ballast is taken from adjacent gravel pits, considerable difficulty is experienced in getting rid of the large rock and boulders found mixed with the gravel.

A very satisfactory method was adopted on one of the roads in the West. Some 8 in. x 10 in. timbers, or heavier, were bolted across the top of the ballast cars from 6 to 8 in. apart. As the steam shovel dumped the material on these timbers, the ballast dropped between the timbers into the car and the large rock and boulders were rolled off on the opposite side of the car. If there were not too many of them, they would be left on top of timbers until the ballast train was pulled out on some fill and there rolled off. In this way the gravel pit would not be encumbered with



Screening Boulders from Ballast.

them. This method avoids the long delays and work necessary when it is attempted to pass these large rock and boulders through the cars and out of the bottom dumps, as they will usually lodge between the bottom of hoppers and the ties and break something.

The accompanying sketch shows the method of placing the timbers. A 6-in. stick is bolted to the top of the car on two sides and the timbers are then bolted to it. It will, of course, only be practical to use this method where the ballast is dumped from the bottom of the car, for as will be seen, a plow could not be pulled through cars equipped in this manner. It is only necessary to have the timbers extend to the ends of the hoppers, if these do not extend to the ends of the ballast car.

TURNOUT KINKS.

BY G. R. BARRY,
Assistant Engineer, Pennsylvania Lines West, Cambridge City, Ind.

MOVING A TURNOUT ENDWISE.

In the re-building or extension of side tracks, and especially in the re-arrangement of yards, it is often necessary to move an old turnout a short distance to put it in the proper location. A quick and economical way to do this is to drag the entire turnout endwise with a locomotive. The ballast is dug out and leveled down to the bottom of the ties, the tracks are disconnected at the first joints beyond the turnout ties at each end and the track taken up between the old and new locations of the turnout. The turnout is then dragged to place by chains attached to a locomotive, the hitch being made around the first tie in the turnout and passing around each rail. A strip of plank is nailed to the top of the turnout ties at each end to preserve the tie spacing. If the road bed is soft the turnout can be jacked up and rails slipped under the ends of the ties and extended ahead to the new location as skids, but usually this is not necessary. In this manner a turnout can be moved endwise any distance up to 200 or 300 ft. with very little damage, and at a very small cost compared with the cost of taking up and rebuilding the turnout, and with very little delay to traffic. The writer recently had a No. 15, 85-lb. turnout in main track moved a distance of about 250 ft. in this manner, and the work was completed and both tracks ready for use within one hour after it was started. An entire yard ladder has been relocated in this manner, moving one turnout after the other.

RENEWAL OF SLIP CROSSING.

A good way to renew a slip crossing in a busy terminal, where the track cannot be obstructed for any length of time, and where a steam wrecking crane is available, is to build the new crossing complete, including the ties, on flat cars and set it off the flat cars and in place with the wrecking crane, first lifting out and setting on cars the old crossing.

SHIFTING TURNOUTS LENGTHWISE.

BY J. W. S.

The usual practice of track foremen is to tear out and relay turnouts when they are to be moved within the limits of their lengths and where there is but little if any lateral throw, instead of shifting them endwise as units.

In moving turnouts where the ties are in good condition, especially on construction like track elevation or yard work where many temporary turnout connections have to be provided, these turnouts can frequently be shifted short distances lengthwise into new temporary or permanent location very economically and generally with the least interference to traffic.

The shorter turnouts up to a No. 9 should be worked along lengthwise after the ties are dug out, by the use of lining bars with the aid of from two to four track jacks set at the forward end at an angle with the line of throw. These jacks lessen the drag of the ties and, as they are pushed over forward with the jacks handles as levers and the throw of the lining bars, they shove the turnout ahead.

On longer turnouts, an easy way to shift them endwise is to jack and throw them along with lining bars on two lines of rails upon which is poured a little oil. After the ties are dug out, a line of these rails should be placed with the base on the ground under the switch ties, about 2 ft. from the ends of these ties on each side of the turnout.

A No. 15 turnout of an important crossover connection to a yard was recently shifted by this method a distance of 30 ft. in order to widen the track centers 2 ft. at the crossover. This turnout was of 90-lb. rail and about 140 ft. in length, and had the heavy interlocking mechanism attached. The time used by two track gangs of about 30 men each, in the actual shift of the turnout, was 1½ hours. This turnout could not have been moved in the usual way without an expensive delay to traffic.

This method of moving turnouts short distances lengthwise not only makes a minimum delay to traffic, and a saving in track labor, but also a saving in spikes and bolts, and saves the switch ties from the extra spike holes.

COLLECTION OF TRACK KINKS.

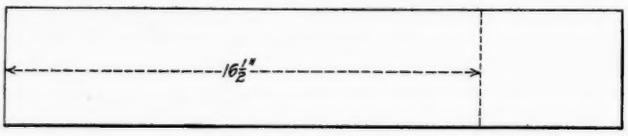
BY CLAUDE L. VAN AUKEN,
Chicago, Ill.

FIDDLE FOR MARKING TIES.

The "tie fiddle" consists of a board with a cleat nailed across one end, as shown in the illustration. The distance from the end of the board to the edge of the cleat is made the standard distance from base of rail to the end of tie for the road on which it is used.

This device can be used to advantage in laying new tracks or switches. The fiddle is laid on the upper face of the tie with the inside of the cleat resting snugly against the tie end. A mark made on the line side of the tie along the end of the fiddle then shows the proper line that the outside of the rail base should occupy after being spiked.

The use of a tie fiddle saves time because it does away with the spikers measuring and remeasuring with the handle of the spike maul in order to get the tie in the proper position under the rail, the outside spike being simply driven on the chalk line. Better line is thus secured, as there is liable to be a variation in the marks on several maul handles. The rails, when set up, can be placed on the line and little work is necessary in moving ties when spiking; in addition, the completed track will be nearly to



Fiddle for Marking Ties.

line, provided the ties were placed in proper position on the grade. The work of supervision is made much easier and a more perfect line on the ties is assured, for a foreman can see at a glance if the spikes are not in proper position. A tie fiddle can easily be made in a few minutes with a board, nail and a saw.

PUTTING IN SLIP SWITCHES UNDER HEAVY TRAFFIC.

One of the difficult kinks in track work is encountered in connection with the installation of slip switches in tracks handling heavy traffic. This problem was met with sometime ago in connection with the construction of new tracks in a congested suburban district to form a four-track system. At the junction of these tracks a network of double slip switches and cross-overs had to be installed under traffic, and strict orders were issued that there was to be no interference with passenger trains. There were over 200 scheduled movements over the main lines between 6:45 a. m. and 6:15 p. m., in addition to a large number of unscheduled movements consisting of extra passenger and freight trains and switching movements. In such work, while the track on which work was being done might be clear for a few minutes, trains were moving in both directions on the other tracks so that when handling long ties or heavy material the work was handicapped by the movements on these adjacent tracks. The foreman in charge had to study the time card closely to determine when each part of the work could be done to best advantage with safety not only for the traffic but also for his men.

In the case in mind, all material was unloaded as near as possible to the place where it was to be used, there being room beyond the outside tracks at this point for storage. The single switch work was comparatively easy for a foreman familiar with the train movements, for after the ties were in fifteen minutes was sufficient time for him to cut the track and put in the frog and main line switchpoint. The guard rail was installed before

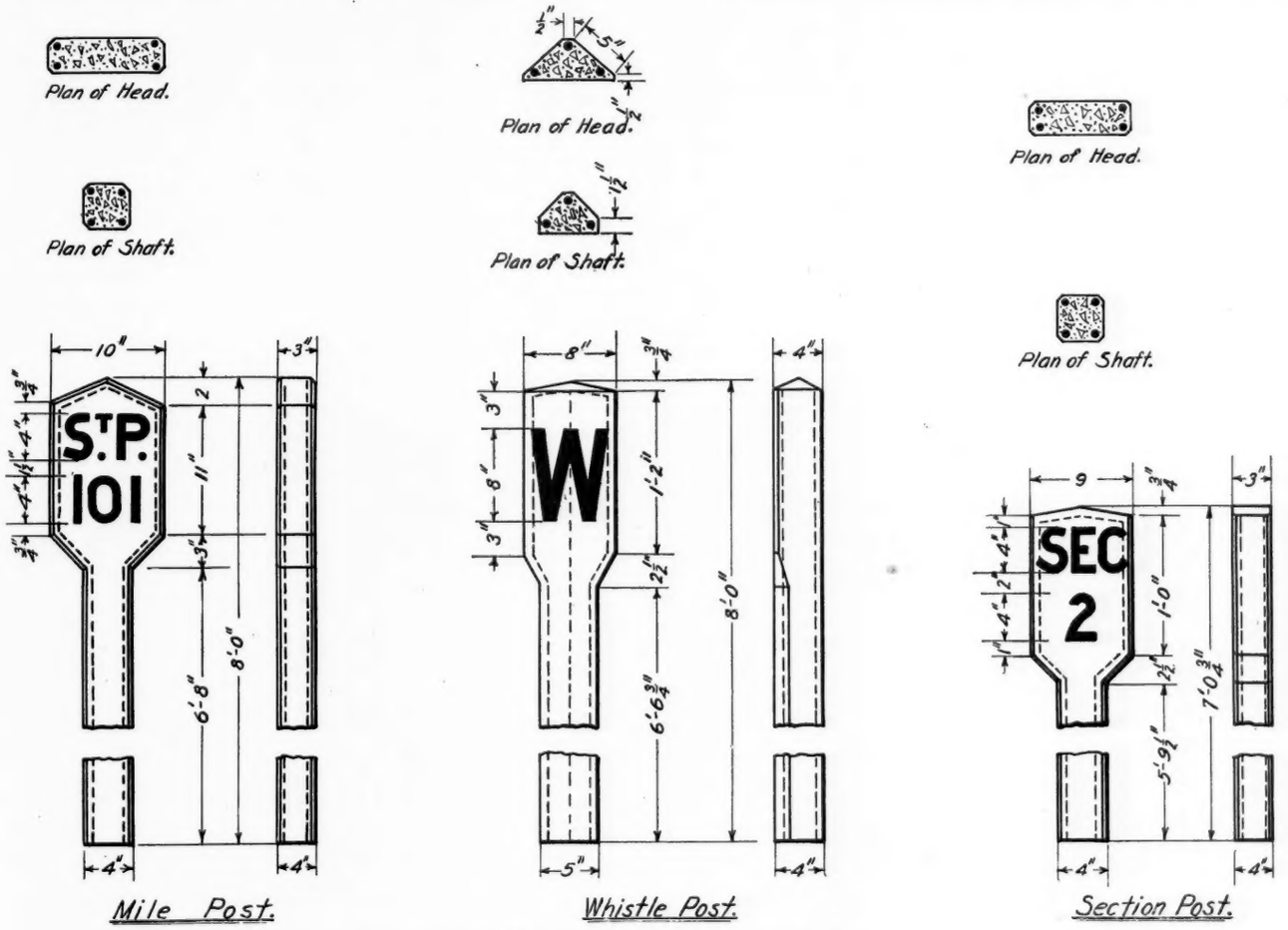
cutting the track and the rails in the track had been previously arranged so that the joints came at the right place to allow dropping the switch in the quickest time possible.

Double slip switch work was much more difficult. A No. 10 slip switch requires ties from 11 to 14 ft. long and timbers 10 in. x 12 in. and 12 in. x 12 in. from 8 to 14 ft. in length, laid, not square across the main line, but at right angles with the diagonal line of the switch. All ties and timbers had to be placed exactly according to the shop plan in order that all the plates might be in their proper position and that the entire turnout would be in proper line and gage when the work was completed. After the ties had been placed, one-half of the switch was assembled on each side of the track in which it was to be placed. The different parts of each half of the slip were bolted together, rails were cut for the connection and bolted on to the frog and stock rails. Switch plates were distributed between the ties and everything possible was done before the track was cut. When everything was in readiness, an opportunity was selected when there was some time between trains. Enough rail was taken out to allow one side of the switch to be quickly thrown in place with lining bars and spiked in a few places, gaging to the rail on the opposite side of the track. Trains were then allowed to pass over until an opportunity came to throw in the other side and gage it. The plates and switch rods were then put on by a few expert men. In handling this work care was taken to see that the original track was in perfect line and surface over the switch ties before the switch was thrown in, so that no lining or surfacing would be necessary before letting trains over. This work was all done with foreign labor. Eight No. 10 and four No. 8 double slip switches were installed under heavy traffic without any trains being diverted to other tracks and without any delay to traffic.

CONCRETE SIGN POSTS.

The Chicago, St. Paul, Minneapolis & Omaha has had concrete mile posts, whistle posts and section posts in service two years with very satisfactory results. The details of these posts are shown in the accompanying figure. The concrete consists of one part cement and two parts coarse sand. The reinforcing bars are ¼ in. round steel and are placed not less than ¾ in. from the surface.

The concrete is placed wet and well puddled before it sets to remove air bubbles. On all surfaces that are to bear letters or figures an ⅛-in. layer of the cement mixed wet enough to trowel easily is laid first and carefully worked to insure a smooth surface. After casting the posts are allowed to set for 48 hours before the sides of the molds are removed and for 48 hours more before the bottom plank is removed. In dry weather the posts are sprinkled during setting or covered with damp sacks to prevent too rapid drying of the surface.



Concrete Sign Posts on the C. St. P. M. & O.

They are made at the company shops at Hudson, Wis., and are shipped out over the system through the storekeeper as required. During the time that these posts have been in service they have proved that they are not affected by frost and are much easier to keep straight than wooden posts, since they do not heave in the ground in cold weather as wooden ones are likely to do. They are very neat in appearance, hold the paint better than wood, and are fireproof.

RELATIVE COSTS OF CONCRETE AND WOODEN POSTS.

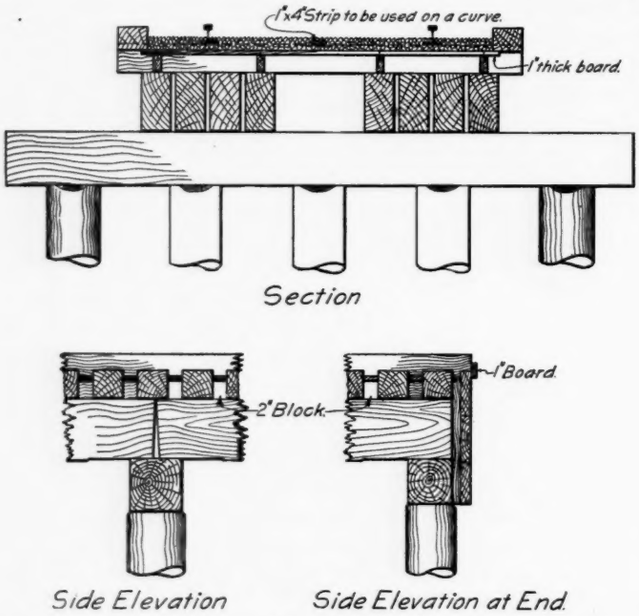
	Mile Posts.	Section Posts.	Whistle Posts.
Concrete with new reinforcing bars..	$1.08	$1.08	$0.91
Concrete with reinforcing bars taken from stock	.76	.76	.67
Wood	2.00	2.00	1.25

PROTECTION OF WOODEN BRIDGES FROM FIRE.

Methods of protecting wooden bridges from fire are being carefully investigated on many roads. A large number of the roads have adopted some form of protection as standard, while others are seriously considering taking such action. The report of the committee of the Association of Operating Officers of the Chicago & North Western, published in the *Railway Age Gazette* of May 19, is an illustration of the movement in this direction. While timber bridges are being replaced by steel and concrete structures on many lines as fast as they require renewal, they will continue to exist on lines of less traffic for many years. As in the case of a washout, the burning of a trestle is a serious matter, not only because of the financial loss involved, but also because of the danger of accidents and the necessity of either tying up traffic entirely until the bridge can be rebuilt or by detouring it over another line. Somewhat closely allied with the subject of fireproofing is that of protection of timber against moisture, and in many cases the method adopted for one protects against both actions.

CAUSES OF FIRES.

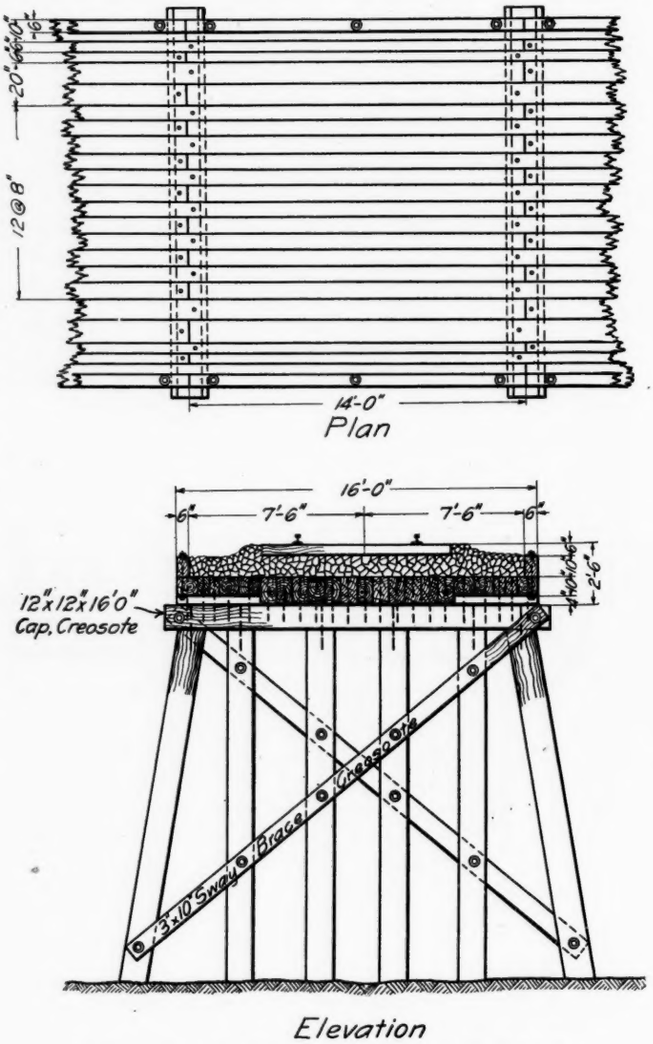
Fires in trestles start either from brush or grass fires on the ground beneath, or from live coals dropping from the ash pans of passing locomotives and lodging in the deck. A comparatively small number of fires also results from forest fires or adjacent conflagrations, while occasionally one will be started from a fire left smouldering by tramps under a bridge. Brush and grass fires can be very largely eliminated by requiring the section forces to keep all brush and vegetation cleared away from below the structures. In addition to this, the base of the piles should be surrounded with a strip of cinders, slag or gravel, which will not support vegetation and which will prevent fires



Standard Plan of Applying Ballasted Deck to Existing Trestle; C. R. I. & P.

from creeping up to the bridge. About 90 per cent. of the fires start from coals dropping on the deck of the structure, an open deck affording excellent lodgment for cinders, which will often smoulder for some time before actually breaking into flames. Especially dangerous portions of the bridge are the back walls at each end, where the decay in the wood is apt to be farthest advanced.

The trouble with fires appears to have rapidly increased since the recent federal legislation requiring changes in the design of the locomotive ash pans has gone into effect. These regulations require that the pans be self-dumping, and after dumping it is frequently impossible to close them tight, because of cinders lodging, or owing to the warping of the pans, in which cases they scatter coals continuously along the track. It is necessary that the maintenance department have the full co-operation of the mechanical department in elminating as far as possible the cause of these fires, both by a prompt repair of the defective ash pans and by properly instructing and disciplining careless firemen. In many instances the number of the engine starting a fire is ascertained and reported. On most roads the



Standard Plan of Fire Protection; A. T. & S. F.

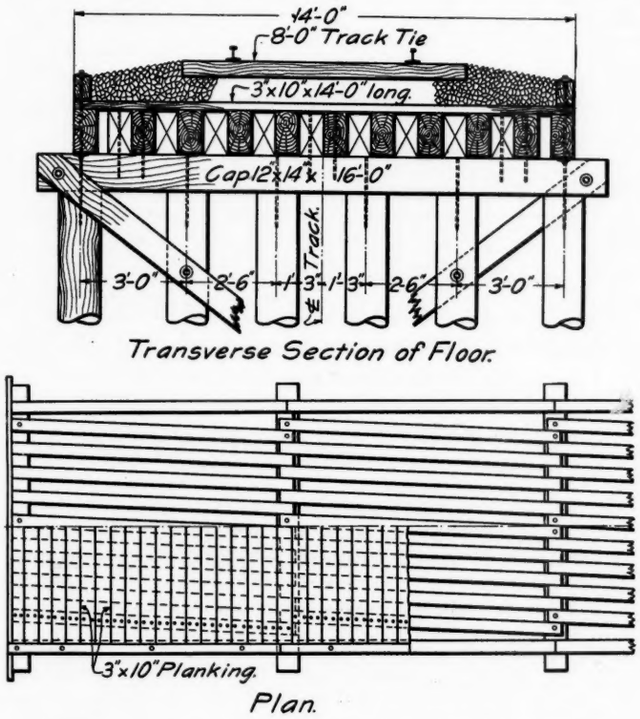
custom is to follow up such a report to see if the engine was properly inspected before leaving the terminal. If the ash pan is found to be in good condition the matter is then placed before the engine crew.

Another detail which should be given careful consideration is the removal of all rotten or sap wood from the timber, for such material affords the best lodgment for sparks and the decayed timber catches fire most readily. The track forces should be carefully instructed to keep all such material cleaned off. They do not ordinarily do this unless their attention is called to it and they are especially instructed. The removal of the decayed timber also tends to increase the life of the rest of the member. With no such material for sparks to lodge in a large proportion of coals falling on the timber do no damage. In fact, some roads do not consider it necessary to provide any protection for the new bridges and apply it only after the structure has had from one to two years' service. Careful attention should

be given to the subject of fire prevention, as well as fire protection, for this is much less expensive.

Open trestles have become such fire traps that many roads are providing some sort of protection for all new structures. In the construction of the Chicago, Milwaukee & Puget Sound all timber bridges were fireproofed from one end to the other. Many roads are also protecting structures already in service, and it seems probable that in a few years practically all timber structures will be protected in some manner.

The Canadian railway commissioners require track walkers to patrol all wooden bridges, the whole of which cannot be seen



Standard Plan of Fire Protection for New Structures; C. R. I. & P.

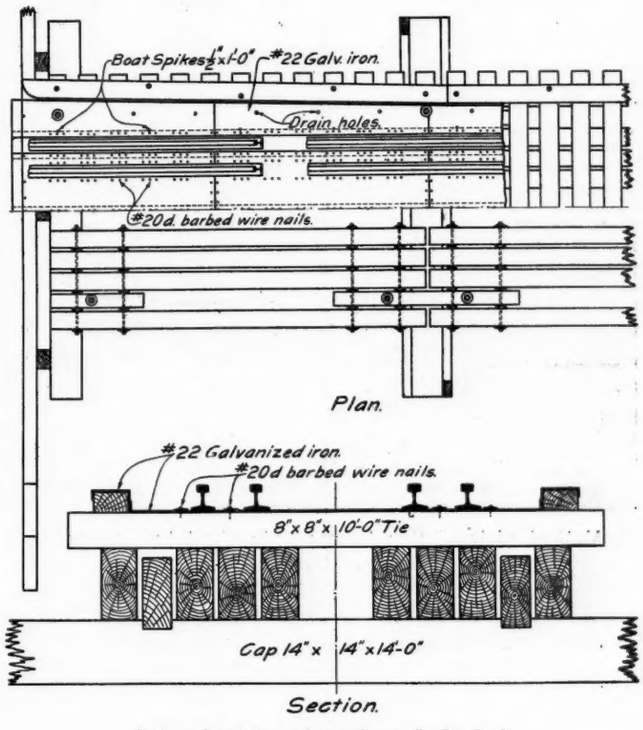
by an approaching train for a distance of at least 1,000 ft., and which are not protected from fire in a manner approved by the commission from May 1 to October 31. The track walker must patrol the track at least twice every 24 hours at intervals of not less than eight hours. It is also required that all brush be cleared away from beneath such structures and that water barrels be provided at frequent intervals. As the Canadian railways have done very little until recently towards fireproofing their trestles, track walkers are provided generally to comply with these requirements.

The annual fire loss is usually kept in the terms of the cost per lineal foot of trestle on the road, which is found by dividing the total loss in dollars by the total amount of trestles in service. This loss varies largely from year to year, and in making any estimate the average of several years should be considered. It very frequently happens that the fire loss for one year will be unusually high, owing to the destruction of one large structure. Climatic conditions, such as very dry weather, also greatly affect the losses, and render any one year's figures misleading.

BALLASTED DECK PROTECTION.

The more general forms of fire protection consist either in the construction of a ballasted deck or in the placing of a metal covering over all or part of the deck. Frequently other methods, such as the painting of a structure with fireproof paint, are adopted, but they are used only to a limited extent. The type of protection most generally used is the ballasted deck, which may either be applied to an old structure or built in connection with a new bridge. In adapting it to an old trestle planks are placed between the ties, forming with the ties a continuous floor, and the ballast is placed upon this. The principal point of difference on the various roads is the position of this plank vertically with reference to the tie. In some cases it is placed with its lower surface on the stringer flush with the tie, while in other cases it is placed with its upper surface level with the top of the tie. Other roads place the plank in all intermediate positions. The first plan offers the serious objection that a large area of the tie is exposed to the moisture which is retained by the ballast and its life is correspondingly decreased. On the other hand, if the plank is placed flush with the top of the tie no resistance is offered to the movement of the ballast over the deck, and the draft as well as the vibration created by moving trains bunch the ballast and leave portions of the timber entirely unprotected. A compromise of the two extremes, in which the top of the plank is placed about 1 in. below the top of the tie, has the minimum disadvantages in that but a small area of the tie is exposed to moisture, while sufficient lodgment is secured for the ballast to hold it in position.

The ballast should be either of coarse gravel or, preferably, crushed stone. With gravel the fine material will sift through the deck, leaving the stones, which will roll and offer little resistance to lateral movement of the track. Crushed stone is not open to this objection, and, while somewhat more expensive, is being used in most cases. Clay has been used on one road with good success, where it was found to practically waterproof the deck as well. The Duluth, South Shore & Atlantic has used stamped sand with better results than either gravel or clay. The application of a ballasted deck to an old structure in any case



Galvanized Iron Covering; C. B. & Q.

will result in shortening somewhat the life of the timber, as any ballast will hold moisture to a certain extent and hasten decay. For this reason several roads, including the Northern Pacific, have abandoned the ballasted deck for such structures and adopted other methods. The accompanying plan, showing the practice of the Chicago, Rock Island & Pacific, is typical of good practice in the application of ballasted decks to existing structures.

In constructing a ballasted deck in connection with a new bridge all the deck material is creosoted to resist the attack of

moisture contained in the ballast. In general, the piling has a life equal to that of two open decks and by treating the deck it will have a life equal to that of the piling. At first thought, the use of creosoted material in the system of fire protection might be considered unwise, but experience has shown the fire hazard to be small. Tests made by the New Haven road, both in the laboratory and in the field, showed that while creosoted ties ignited more readily and burned more fiercely than untreated ties, the effects were not nearly so serious, for in the burning of the creosote a film of carbon or soot formed on the surface of the timber which protected it and the fire did not work into the wood as far as in the untreated timber. Again, with such a deck only the guard rails are exposed to sparks falling from above.

The floor of the ballasted deck is either formed of stringers located closely together upon which the ballast is placed directly, or of planks laid side by side on sufficient stringers to carry the load. The plan of the Atchison, Topeka & Santa Fe, shown herewith, is an example of the first type. The deck is composed of 8-in. x 14-in. stringers placed side by side, upon which 10 in. of ballast is placed, the span length between bents being 14 ft. Beyond the ends of the ties 10-in. x 10-in., and 6-in. x 10-in. stringers are used with 4-in. planks on the caps. On the Seaboard Air Line 6-in. x 12-in. stringers are used, with a span length of 12 ft. 6 in. About six-tenths cubic yards of ballast is required per lineal foot of single track trestle. The standard plans of the Rock Island provide for 8-in. x 16-in. stringers placed 8 in. apart and skewed 8 in. in a span of 15 ft. Above these 3-in. x 10-in. planks are placed, and the ballast placed on this plank floor. On the Alabama Great Southern a similar arrangement is used, except that 6-in. x 16-in. stringers are placed parallel to the center line of the bridge.

Both types of ballasted deck structures are open to the objection that proper inspection is made more difficult, and that the cost of making repairs is largely increased. The item of repairs is, of course, more serious with the old structures than with a new structure built with a creosoted deck, as the latter type

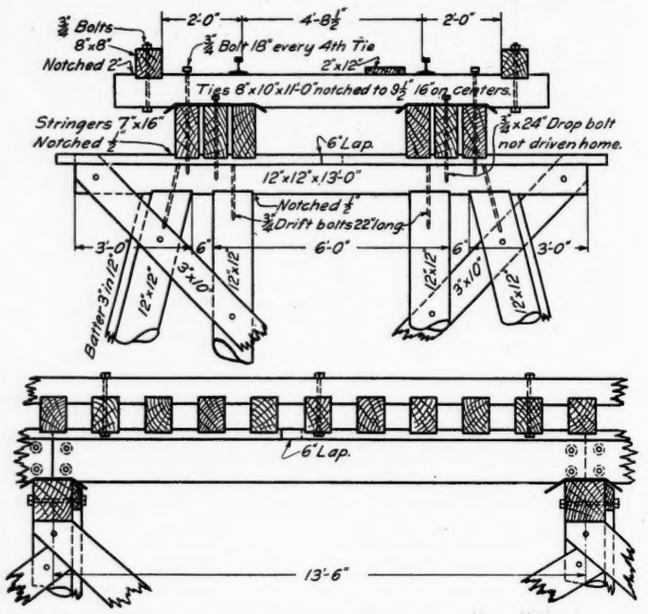
Method of Insulating Where Galvanized Iron Covering is Used.

should not require any repairs for a number of years. The cost of applying the ballasted deck to an old structure is about 30 cents per lineal foot, while the cost of the creosoted ballasted deck ranges from about $19 to $22 per lineal foot, or from $7 to $10 per ft. more than the cost of the unprotected open deck.

METAL COVERING.

In protecting trestles with a metal covering galvanized iron is most generally used, although some of the commercial forms of pure iron are now beginning to be used to a limited extent. Two methods of placing this metal protection are common. One is to place the covering on top of the ties, thus protecting the entire deck, while the other is to cover but the caps and stringers. Either method also serves to protect the timber from moisture. In the issue of the *Railway Age Gazette* of June 16, 1911, there appeared an article describing the practice of the Nashville, Chattanooga & St. Louis, where both the caps and stringers have been covered for a number of years, the object being primarily to protect against moisture, but at the same time also protecting against fire. No. 22 galvanized iron is generally used, although No. 24 galvanized iron is used in some instances.

In covering the deck with metal some roads place it only inside the rails, as it is here that most of the coals drop from the ash pans. In other cases, the metal is carried under the rails from the outside fender to fender, and in many instances the fenders as well are covered, as shown in the drawing illustrating the practice on the Chicago, Burlington & Quincy. This latter method of complete protection costs from 75 cents to 80 cents per lineal foot of bridge. One serious objection to the use of galvanized iron is that with the metal commonly used corrosion resulting from the chemical action of the water and cinders is very destructive. When holes appear this covering



Stringers and Caps Covered with Galvanized Iron; Southern Railway.

assists rather than retards ignition by affording lodgment for the sparks, and becomes a menace rather than a protection. The dissatisfaction with this metal has led several roads to experiment with various forms of pure iron, which, although more expensive, are expected to give a relatively higher life. A completely covered deck with the iron in contact with the rails is seriously objectionable in automatic signal territory, and, if used, must be insulated. One road which is now installing automatic signals is removing the covering from the bridges within the limits of the signal work, because of this difficulty. However, the track can be readily insulated by removing a small strip of the metal along the center line of the track and covering the gap with a small wooden strip, as illustrated in the accompanying view showing the practice of the Northern Pacific in automatic signal territory. It has also been found difficult to prevent the covering from working loose as the vibration creates a strong tendency for the metal to creep. The action of brine dripping from refrigerator cars is also destructive to galvanized iron.

Where only the caps and stringers are covered, as illustrated by the practice on the Southern, the cost is reduced to about 40 cents per lineal foot of bridge. Although by this method ties and fenders are not protected, the more important members are, and if a spark should lodge in a tie the fire would not spread to any extent. Some object to this type of protection, because of the increased difficulty in inspection of the members, and the fact that the condition of the interior stringers cannot

be readily determined. This difficulty can be largely eliminated by placing the best timbers on the inside and the poorer ones where they can be watched. The life of timber protected in such a way from moisture should be that of three or four decks, and there should be no reason for the weakening of the inner chords if the poorer material is properly removed at the time the deck is renewed. Several instances have been noted where timber so protected has been found to be in good condition after over 20 years of service.

The action of salt water is very severe on galvanized iron, and on some roads near the seashore, such as the New Haven, it has been necessary to substitute zinc for galvanized iron.

OTHER METHODS.

The use of fireproofing paints has not been generally adopted throughout the country, but has been confined very largely to the New England states and Canada, where certain products have given good results. The use of a paint is one of the methods approved by the Canadian railway commissioners as complying with their requirements for fire protection. Fire-resisting paint is largely used on the Boston & Maine, New York, New Haven & Hartford and Central of Maine, and is standard on these roads. It has not been tried to any extent in the west until recently, but a number of roads are making careful tests of such materials now under conditions approaching actual service as closely as possible. From the favorable results secured in these tests so far, it appears probable that the use of paint will become more general throughout the country. One advantage of the use of paint is the ease of application. Also, it does not interfere in any way with inspection and repairs of a structure. The cost of paint applied to the deck averages about 29 cents per lineal foot of bridge. Where paint has been used it has been found to be effective for from three to five years, at the expiration of which time the structure should be repainted. Paint should be reapplied also following a fire, as it loses a large part of its effectiveness when exposed to one hot conflagration.

Another material used to a limited extent to protect bridges against fire is whitewash. This has been used on a number of roads, and while somewhat unsightly in appearance, has given good results. Whitewash also acts beneficially as a preservative of timber. Salt is also used with very good results in a number of instances, acting both as a fire retardant and as a preservative. The Illinois Central has used zinc treated material in open deck structures in several places with good results, finding that timber treated in this way was very hard to set on fire. In some few cases thin concrete or earth fire walls have also been considered by certain roads, but their use is very limited.

While several roads place ballasted decks on existing structures, the general practice is to protect such bridges with a galvanized iron covering until they require renewal, at which time ballasted decks are built. A comparatively heavy outlay for a ballasted deck for a structure with but a few years' life is not considered advisable. A combination of galvanized iron protection for caps and stringers with the ties protected by a fire-resisting paint should give an economical protection which would ward off fires for the remainder of the life of the structure. In building the new structures the ballasted deck is frequently adopted because of the advantages from the track standpoint as well as fire protection, and its use is in accordance with present day good practice.

The government of Brazil has adopted the plans to extend the Central Railroad of Brazil from Pirapora to Belem on the northern coast. This project will bring the state of Amazonia into closer touch with central and south Brazil, and will shorten the time necessary for the trip between Rio de Janeiro and Belem from 12 days to 3 days. The contract for carrying out this project will be submitted for public competition.

WOOD PRESERVERS' ASSOCIATION.

The eighth annual convention of the Wood Preservers' Association will be held at the Hotel Sherman, Chicago, January 16, 17 and 18, 1912. Papers will be presented as follows: Production of the Wooden Cross Tie, by A. R. Joyce; Treating Seasoned versus Unseasoned Ties, by F. J. Angier, superintendent timber preservation Baltimore & Ohio; Cutting and Seasoning Timber, by A. Meyer, superintendent Chicago, Burlington & Quincy tie plant; Creosotes and Creosoting Oils, by David Allerton; Efficiency in Plant Operation, by E. A. Sterling, forester Pennsylvania Railroad; Creosote Oil Specifications and Methods of Analysis, by S. R. Church, chemist Barrett Manufacturing Company; Inspectors and Inspection of Material and Treatments at Commercial plants, by R. L. Allardyce; Preservation of Power Transmission Poles, by W. R. Wheaton, timber engineer San Joaquin Light & Power Company; Wood Block Pavement from Construction Standpoint, by Day I. Okes, the Kettle River Company.

In addition to these papers, Howard F. Weiss, assistant director of the forest products laboratory at Madison, Wis., will give an illustrated lecture on the Structure of Commercial Woods in Relation to Their Injection with Preservatives. Other papers will be presented by W. F. Goltra, president W. F. Goltra Tie Company; R. J. Calder, secretary International Creosoting & Construction Company; J. H. Nelson, Carolina Pine Lumber Company; M. Fredendoll, chemist Atchison, Topeka & Santa Fe; J. H. Waterman, superintendent timber preservation Chicago, Burlington & Quincy; Dr. von Schrenk, consulting timber engineer Chicago, Rock Island & Pacific, and H. M. Rollins, superintendent Gulfport Creosoting Company.

The annual banquet for members and friends will be given on Wednesday evening.

The association is completing a very prosperous year. The membership has nearly doubled during the year, and a great deal of interest is being taken in its work.

SECTION FOREMEN'S INSPECTION TRIPS.

The plan was adopted on the Shasta division of the Southern Pacific last summer of sending the section foremen over the division on an inspection trip monthly. The foremen on alternate sections only made this trip at the same time, and the jurisdiction of those foremen remaining at home was extended over the two sections for that day to provide for the regular track patrol and any emergency. The men gathered at some point on the line and Division Superintendent J. W. Metcalf's car was turned over to them. The car was attached to one of the regular trains and the men traveled over the division noting the conditions of the different foremen's track and discussing it among themselves. The foremen called attention to any irregularities or deviations from the standards provided by the company, and these were checked closely with prints which were carried on the trip, and any faulty ideas corrected. The maintenance rules of the company were also discussed freely and explained for the benefit of the foremen. Methods of maintaining track were also talked over among them for the special benefit of the younger foremen, who received much information which was of assistance to them in handling their work more rapidly and economically.

The roadmaster and the division accountant made the trip with the men, the division engineer and superintendent remaining away so that they would feel more free to discuss and criticise one another's work. Before the first trip was made they were given to understand that this arrangement was made primarily for business and would not be continued unless direct benefits were secured. The men entered heartily into the spirit of the plan and gained much good from the mutual criticisms and suggestions.

In the evening the men were gathered about a table in the

car and the accountant explained the various accounts established by the Interstate Commerce Commission, and used by maintenance of way employees, instructing them regarding the proper preparation of their reports. After this a general discussion was indulged in, and any points of doubt or interest brought out and settled.

The local officials are highly pleased with the results and expect to continue these trips next year. In addition to giving the men a broader view of track work, they tend towards uniformity of work on the division as well as increased efficiency, for the foremen absorb many new ideas on them. It is found that the men are not backward in criticising one another, and this criticism acts as a strong incentive for each of them to keep his work in good condition, for when a man is once criticised for some detail he is quite certain to see that he is not caught on the same point the next trip. Such criticism is often more effective than that of the higher officers. Several of the foremen have written unsolicited letters to the division officers telling of the benefits they have received.

THE TURNOUT.*

BY F. S. STEVENS,
Engineer Maintenance of Way, Philadelphia & Reading.

Much has been said and written on the subject of turnouts and probably nothing that is new can be offered, but perhaps attention can be invited to some features of merit that are not in such common use as they would be if the benefits to be gained by their use were better understood or more generally recognized.

The most symmetrical and desirable form of turnout from an operating standpoint would be a continuous curve from point of switch to point of frog, the curve being tangent to the center line of track at both points, and the turnout distance being equal to twice the width of the gage multiplied by the number of the frog. A switch that would make such ideal conditions of installation and operation possible has not yet been invented, the nearest approach being the split or point switch, making an angle of approximately 1 deg. with the main rail. Where switches of this angle are installed, speeds of from 30 to 35 ft. per second can be maintained with little discomfort, and as at this speed the turnout curve of approximately 3 deg. that would be used with a No. 15 frog can be operated without superelevation and with less discomfort than is caused by the change of direction at the point of the switch, it follows that frogs of less angle need not be used unless other conditions than speed of operation over turnouts become the governing factors.

The extreme points of all switches should be protected from contact with wheels as far as possible to prolong the life of the switch rails by avoiding wear where the metal has the least section. It has been demonstrated frequently that where switches with thick points are used and the extreme points are struck at intervals by passing wheels, the metal wears off rapidly because after the wheels strike such points they recoil, the switch rails soon become very blunt and cars with badly worn or sharp flanges are liable to be derailed. This condition is seldom found where switches with fine and well-fitting points are used, because such points provide a relatively smooth surface for the flanges of the wheels to follow and the hard impinging and grinding blows that are received by blunt switch points are avoided, so that the rails wear evenly throughout their length, last much longer, are safe to continue in service until the rails are worn out, and are, therefore, much more economical to use.

There may be some difference of opinion as to the proportions or ratios that produce the most symmetrical appearance in turnouts where split switches are used, but common practice appears to confirm the view that in ordinary main line and yard work the frog angle should be generally not less than approximately four times the switch angle. If this practice were followed a switch 10 ft. long would not be used with a frog of less angle than No. 5, a switch 15 ft. long would not be used with a frog of less angle than No. 8, a switch 20 ft. long would not be used with a frog of less angle than No. 10, and a switch 26 ft. long would not be used with a frog of less angle than No. 15.

It is also proper to invite attention to the advantage that can sometimes be gained where the length of the radius is the controlling factor, by curving both switch and frog, using a frog of the least angle that will meet conditions and turning part of the angle back of the frog, thereby increasing the radius and making it possible in some cases to operate engines, the use of which would otherwise be prohibited.

In cases where room is limited and it is important that the greatest possible length of radius be used, some time can generally be saved by making a diagram on tracing linen of the frog angle to be used and from the intersection of the gage lines draw the radial lines; then by placing this tracing over the plan of the existing track and sticking a pin through the radial line at the point from which the diagram will rotate to the point to be reached, the greatest radius possible with the frog angle assumed will be shown, and as the radius of the turnout curve should be a little longer than the radius of the curve back of the frog, the use of the diagram will also show whether the frog angle assumed is the proper one, and if not, whether a less or greater angle should be used.

In arranging for new installations the first and most important matter is to decide on the angle of frog most suitable to be used, or that will best meet the conditions as to room available, character and volume of traffic to be handled and speed of movement. If room is limited, the minimum length of radius that is permissible is often the controlling factor, when, to secure the best possible results, both frog and switch must be curved on the turnout side, to the end that all distance available may be utilized in turning angle and thereby secure the easiest curvature that the fog angle and the other conditions will permit.

If that part of the switch rail back of the planing that is bent to form part of the turnout curve is longer than the wing rail of the frog, that also becomes a part of this curve, and the distance from point of switch to point of frog is correspondingly shortened, because with given switch and frog angles the distance from point of frog to center of the turnout curve cannot be changed. But as the switch generally makes a somewhat greater angle with the main rail than was used in computing the turnout distance, it follows that in adjusting the theoretical to a practical distance to avoid unnecessary use of rail or to cut rail to advantage, it is proper to reduce the theoretical distances given in the table, within reasonable limits, this reduction being small, of course, when frogs of large angle are used and increasing as the frog angle diminishes. But as a reduction in distance is a concession that is admissible only on the basis of a corresponding increase in switch angle, the reduction should not be much in any case, and as the distances, or lengths of rail, on both the lead and turnout sides are given, the proper difference in length should be maintained, and it is desirable that, where it is possible to do so, a cut of one rail be made in such a way as to make the lengths required on both sides.

If, however, the question is one of maintaining speed or avoiding unnecessary loss of time by reduction of speed in passing through turnouts or crossovers, the switch angle instead of the frog angle becomes the more important matter for consideration, because the angle of the switch causes an abrupt change in direction without any easement whatever. To reduce the shock as much as possible, the angle is reduced in our longer and easier switches to approximately one degree, but this is too great a change in direction to be made at high speed. Therefore the speed must be modified to meet track conditions, with the result that more or less time must be lost when turnouts must

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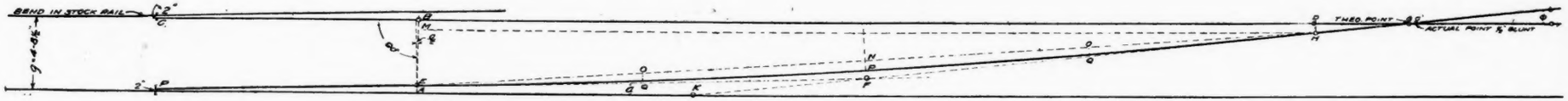


SWITCH RAILS PLANED TO ¼ THICKNESS AT POINT AND SQUARE WHEN HALF THROWN.

THEORETICAL POINT OF ALL FROGS 2/5 OF TOTAL LENGTH FROM TOE AND 3/5 OF TOTAL LENGTH FROM HEEL

FROG RATIO	LENGTH	ANGLE Φ	SINE	TANGENT	COSINE	DISTANCE -GL-M	DISTANCE GG-F	DISTANCE HD-M SIN Φ	LENGTH OF SW PRACTICAL	LENGTH OF SWITCH THEORETICAL	ANGLE OF SWITCH Θ	RATIO OF SWITCH	SINE	SPREAD AT HEEL	Φ+Θ/2	SINE	TANGENT	COSINE	DIST EM G-E-M SIN Φ	Θ/2	SINE	LEAD SIDE BD	TURNOUT ARC EH	TOTAL LEAD SIDE CG+L	Φ-Θ/2	SINE	TURNOUT RADIUS	TURNOUT CURVE	MIDDLE ORDINATE	SIDE ORDINATE
1-3	15	18°55'28"	.3243210	.3428533	.9459471	6.00	.125	1.946	10.0	10.435	2°44'41"	1-20.807	.0479167	21	10°50'07"	.1879861	.1913981	.9821717	4.500	1°22'23"	.0239620	23.520	24.020	27.560	8°05'20"	.1407092	85.0620	67°22'	.846	.654
1-4	-	14°15'00"	.2461533	.2539861	.9692311	-	.167	1.477	-	-	-	-	-	.30	8°29'53"	.1477758	.1494161	.9890209	2.751	-	-	18.193	18.512	34.175	5°45'06"	.1002170	92.2050	62°10'	.464	.348
-	-	-	-	-	-	-	-	-	-	-	-	-	-	21	-	-	-	-	4.500	-	-	30.225	30.503	34.305	-	-	151.930	37°42'	.765	.573
1-5	-	11°25'16"	.1980185	.2020191	.9801981	-	.208	1.188	10.0	10.435	2°44'41"	1-20.870	.0479167	.30	7°05'01"	.1233176	.1242661	.9923673	3.020	1°22'23"	.0239620	24.285	24.514	40.194	4°20'14"	.0756266	161.914	35°22'	.464	.348
-	-	-	-	-	-	-	-	-	-	-	-	-	-	21	-	-	-	-	4.500	-	-	36.320	36.526	40.703	-	-	241.251	23°43'	.690	.517
-	-	-	-	-	-	-	-	-	11.0	11.478	2°29'46"	1-22.956	.0435606	-	6°57'32"	.1211571	.1220561	.9926334	-	1°14'54"	.0217958	26.966	27.179	41.478	4°27'44"	.0778017	238.697	24°00'	.724	.543
-	-	-	-	-	-	-	-	-	13.0	13.652	1°49'50"	1-31.304	.0319444	-	6°37'33"	.1153850	.1161601	.9933208	-	0°54'55"	.0159740	38.812	39.052	44.889	4°47'43"	.0835813	233.306	24°35'	.817	.612
1-6	-	9°31'38"	.1653162	.1678311	.9862071	-	.250	0.993	10.0	10.435	2°44'41"	1-20.870	.0479167	.50	6°08'12"	.1069004	.1075161	.9942698	3.215	1°22'23"	.0239620	29.875	30.094	46.123	3°23'25"	.0591370	254.282	22°32'	.445	.353
-	-	-	-	-	-	-	-	-	-	-	-	-	-	21	-	-	-	-	4.500	-	-	41.962	42.121	46.595	-	-	353.911	16°06'	.623	.467
-	-	-	-	-	-	-	-	-	11.0	11.478	2°29'46"	1-22.956	.0435606	.50	6°00'43"	.1047358	.1053151	.9945000	3.215	1°14'54"	.0217958	30.536	30.715	47.786	3°30'55"	.0613147	250.313	22°53'	.471	.353
-	-	-	-	-	-	-	-	-	-	-	-	-	-	21	-	-	-	-	4.500	-	-	42.827	42.992	47.898	-	-	350.365	16°21'	.639	.494
-	-	-	-	-	-	-	-	-	13.0	13.652	1°49'50"	1-31.304	.0319444	.50	5°40'44"	.0989550	.0994401	.9950922	3.215	0°54'55"	.0159739	32.319	32.514	53.569	3°50'54"	.0671136	242.045	23°41'	.546	.409
-	-	-	-	-	-	-	-	-	-	-	-	-	-	21	-	-	-	-	4.500	-	-	45.325	45.510	52.149	-	-	338.788	16°55'	.764	.573
1-7	-	8°10'17"	.1421347	.1435592	.9898471	-	.292	0.855	10.0	10.435	2°44'41"	1-20.870	.0479167	.50	5°27'32"	.0951315	.0955641	.9954646	3.355	1°22'23"	.0239620	35.147	35.280	51.439	2°42'45"	.0473244	372.609	15°23'	.418	.313
-	-	-	-	-	-	-	-	-	11.0	11.478	2°29'46"	1-22.956	.0435606	-	5°20'02"	.0929596	.0935641	.9956699	-	1°14'54"	.0217958	35.966	36.107	53.258	2°30'14"	.0494986	364.566	15°45'	.447	.335
-	-	-	-	-	-	-	-	-	13.0	13.652	1°49'50"	1-31.304	.0319444	-	5°00'03"	.0871702	.0875031	.9961934	-	0°54'55"	.0159739	38.348	38.509	59.640	3°10'13"	.0553035	347.971	16°28'	.530	.397
-	-	-	-	-	-	-	-	-	16.5	17.217	1°39'51"	1-34.435	.0290404	-	4°55'04"	.0857260	.0860422	.9963187	-	0°49'55"	.0145197	38.993	39.157	61.785	3°15'13"	.0567557	344.776	16°37'	.554	.415
-	-	-	-	-	-	-	-	-	18.0	18.783	1°31'31"	1-37.565	.0266179	-	4°50'54"	.0845184	.0848222	.9964220	-	0°45'45"	.0133078	39.550	39.718	63.842	3°19'23"	.0579657	342.409	16°44'	.576	.432
1-8	-	7°09'16"	.1244963	.1254722	.9922201	-	.333	0.747	15.0	15.652	1°49'50"	1-31.304	.0319444	-	4°29'30"	.0783141	.0785556	.9969287	3.461	0°54'55"	.0159739	44.078	44.210	65.411	2°39'40"	.0464284	475.937	12°01'	.513	.385
-	-	-	-	-	-	-	-	-	16.5	17.217	1°39'51"	1-34.435	.0290404	-	4°04'34"	.0709645	.0713611	.9974495	-	0°49'55"	.0145197	44.909	45.047	67.742	2°44'39"	.0478764	470.252	12°11'	.539	.404
-	-	-	-	-	-	-	-	-	18.0	18.783	1°31'31"	1-37.565	.0266179	-	4°20'20"	.0756536	.0760813	.9971340	-	0°45'45"	.0133078	45.625	45.768	69.936	2°48'49"	.0490870	465.979	12°18'	.562	.421
-	-	-	-	-	-	-	-	-	20.0	20.869	1°22'22"	1-41.738	.0239583	-	4°15'46"	.0743309	.0747537	.9972336	-	0°41'11"	.0119794	46.436	46.582	72.789	2°53'26"	.0504186	461.758	12°25'	.597	.447
1-9	-	6°21'35"	.1107703	.1114533	.9938461	-	.375	0.665	15.0	15.652	1°49'50"	1-31.304	.0319444	-	4°03'42"	.0714104	.0718392	.9974476	3.543	0°54'55"	.0159739	49.518	49.630	70.893	2°15'52"	.0395117	627.839	9°07'	.490	.367
-	-	-	-	-	-	-	-	-	16.5	17.217	1°39'51"	1-34.435	.0290404	-	4°00'45"	.0699645	.0703696	.9975495	-	0°49'55"	.0145197	50.540	50.654	73.413	2°20'52"	.0409650	618.089	9°16'	.517	.387
-	-	-	-	-	-	-	-	-	18.0	18.783	1°31'31"	1-37.565	.0266179	-	3°56'33"	.0687553	.0691818	.9976335	-	0°45'45"	.0133078	51.302	51.345	75.877	2°25'02"	.0421760	610.892	9°25'	.544	.408
-	-	-	-	-	-	-	-	-	20.0	20.869	1°22'22"	1-41.738	.0239583	-	3°51'56"	.0674232	.0678378	.9977243	-	0°41'11"	.0119794	52.441	52.586	78.816	2°29'36"	.0435032	603.944	9°29'	.572	.429
1-10	-	5°43'30"	.0997539	.1002541	.9950121	-	.417	0.598	16.5	17.217	1°39'51"	1-34.435	.0290404	-	3°41'40"	.0644353	.0647570	.9979219	3.610	0°49'55"	.0145197	55.939	56.041	78.656	2°01'43"	.0354276	790.697	7°15'	.497	.372
-	-	-	-	-	-	-	-	-	18.0	18.783	1°31'31"	1-37.565	.0266179	-	3°37'30"	.0632259	.0635352	.9979992	-	0°45'45"	.0133078	57.009	57.107	81.426	2°06'00"	.0366437	779.084	7°21'	.524	.393
-	-	-	-	-	-	-	-	-	20.0	20.869	1°22'22"	1-41.738	.0239583	-	3°32'56"	.0619002	.0622018	.9980823	-	0°41'11"	.0119794	58.229	58.339	84.646	2°10'34"	.0379712	767.930	7°26'	.553	.415
-	-	-	-	-	-	-	-	-	24.0	25.043	1°08'38"	1-50.086	.0199653	-	3°26'04"	.0599065	.0600113	.9982040	-	0°34'15"	.0099821	60.225	60.272	90.042	2°17'26"	.0399670	758.872	7°36'	.603	.452
1-11	-	5°12'19"	.0907843	.0911100	.9958761	-	.458	0.544	20.0	20.869	1°22'22"	1-41.738	.0239583	-	3°17'20"	.0573704	.0575641	.9983529	3.664	0°41'11"	.0119794	63.676	63.882	90.174	1°34'58"	.0334362	955.045	6°00'	.534	.400
-	-	-	-	-	-	-	-	-	24.0	25.043	1°08'38"	1-50.086	.0199653	-	3°10'28"	.0553758	.0555681	.9984684	-	0°39'19"	.0099821	66.081	66.184	96.399	2°01'30"	.0354324	933.093	6°08'	.587	.440
-	-	-	-	-	-	-	-	-	26.0	27.130	1°03'21"	1-54.260	.0184295	-	3°01'30"	.0546113	.0548182	.9985077	-	0°31'40"	.0092113	67.014	67.107	99.472	2°04'29"	.0362028	926.613	6°11'	.608	.456
1-12	20	4°46'16"	.0831899	.0834479	.9965331	8.00	.500	0.665	20.0	20.869	1°22'22"	1-41.738	.0239583	-	3°04'20"	.0535947	.0537671	.9985628	3.543	0°41'11"	.0119794	66.035	66.117	94.535	1°41'58"	.0296565	1114.545	5°08'	.491	.386
-	-	-	-	-	-	-	-	-	24.0	25.043	1°08'38"	1-50.086	.0199653	-	2°57'28"	.0516001	.0517668	.9986678	-	0°34'19"	.0099821	68.586	68.674	101.086	1°48'30"	.0316330	1084.605	5°17'	.544	.408
-	-	-	-	-	-	-	-	-	26.0	27.130	1°03'21"	1-54.260	.0184295	-	2°54'30"	.0508351	.0509001	.9987071	-	0°31'40"	.0092113	67.618	67.708	104.118	1°51'29"	.0324235	1074.776	5°20'	.565	.423
-	-	-	-	-	-	-	-	-	28.0	29.217	0°58'50"	1-58.435	.0171131	-	2°52'34"	.0501763	.0502840	.9987603	-	0°29'25"	.0085568	70.529	70.623	107.029	1°53'44"	.0330776	1067.338	5°22'	.584	.436
1-13	-	4°24'18"	.0768060	.0771033	.9970461	-	.542	0.614	24.0	25.043	1°08'38"	1-50.086	.0199653	-	2°46'28"	.0484043	.0485461	.9988302	3.594	0°34'19"	.0099821	74.181	74.266	106.723	1°57'50"	.0284547	1304.705	4°24'	.490	.388
-	-	-	-	-	-	-	-	-	28.0	29.217	0°58'50"	1-58.435	.0171131	-	2°41'34"	.0469606	.0470928	.9988958	-	0°29'25"	.0085568	76.434	76.512	112.976	1°42'44"	.0298794	1280.146	4°28'	.571	.428
1-14	-	4°05'28"	.0713427	.0713525	.9974521	-	.583	0.571	24.0	25.043	1°08'38"	1-50.086	.0199653	-	2°37'05"	.0456681	.0457716	.9989507	3.687	0°34'19"	.0099821	79.578	79.650	112.161	1°28'25"	.0257168	1548.416	3°42'	.512	.384
-	-	-	-	-	-	-	-	-	28.0	29.217	0°58'50"	1-58.435	.0171131	-	2°32'08"	.0442442	.0443287	.9990208	-	0°29'25"	.0085568	82.139	82.212	118.722	1°33'19"	.0271414	1514.328	3°47'	.536	.418
1-15	-	3°48'06"	.0665931	.0667411	.9977801	-	.625	0.533	24.0	25.043	1°08'38"	1-50.086	.0199653	-	2°28'52"	.0432900	.0433830	.9990626	3.675	0°34'19"	.0099821	84.838	84.900	117.463	1°20'14"	.0233367	1818.852	3°09'	.496	.372
-	-	-	-	-	-	-	-	-	26.0	27.130	1°03'21"	1-54.260	.0184295	-	2°22'00"	.0412944	.0413829	.9991470	-	0°31'40"	.0092113	86.373	86.435	120.998	1°22'52"	.0241026	1792.900	3°12'	.520	.390
-	-	-	-	-	-	-	-	-	28.0	29.217	0°58'50"	1-58.435	.0171131	-	2°16'48"	.0397829	.0398814	.9992080	3.584	0°29'25"	.0085568	87.720	87.789	124.345	1°25'08"	.0247618	1772.485	3°14'	.544	.408
-	-	-	-	-	-	-	-	-	30.0	31.304	0°54.55"	1-62.608	.0159722	-	2°14.51"	.0392162	.0392246	.9992510	-	0°27.27	.0079872	88.935	89.005	127.560	1°27.05	.0253288	1756.794	3°16'	.564	.423
1-16	25	3°34'47"	.0624373	.0625591	.9980501	10.00	.667	0.624	28.0	29.217	0°58'50"	1-58.435	.0171131	-	2°16'48"	.0397829	.0398814	.9992080	3.584	0°29'25"	.0085568	90.032	90.096	128.693	1°17'38"	.0226776	1986.277	2°55'	.518	.384
-	-	-	-	-	-	-	-	-	30.0	31.304	0°54.55"	1-62.608	.0159722	-	2°14.51"	.0392162	.0392246	.9992510	-	0°27.27	.0079872	91.332	91.396	131.999	1°19.56	.0232496	1965.410	2°56'	.538	.399
1-18	-	3°10'56"	.0555117	.0555397	.9984581	-	.750	0.555	28.0	29.217	0°58'50"	1-58.435	.0171131	-	2°04'53"	.0363191	.0363943	.9993400	3.655	0°29'25"	.0085568	100.334	100.387	139.284	1°06'03"	.0192119	2617.649	2°11'	.485	.362
-	-	-	-	-	-	-	-	-	30.0	31.304	0°54.55"	1-62.608	.0159722	-	2°02'55"	.0357474	.0357720	.9993610	-	0°27.27	.0079872	102.142	102.197	142.892	1°08.00"	.0197791	2583.282	2°13'	.506	.379
1-20	30	2°51'51"	.0499683	.0500301	.9987511	12.00	.833	0.600	-	33.0	34.434	0°49.46"	1-68.869	.0144899	-	1°53'25"	.0329759	.0329935	.9994560	3.908	-	-	109.374	109.418	152.207	0°58.28"	.0170066	3216.818	1°47'	.485	.348
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1°50'30"	.0322345	.0322550	.9994800	-	0°24.54"	.0072430	111.691	111.936	157.724	1°01'01"	.0177480	3133.308	1°49'	.497	.372

NOTE-

THE FOLLOWING TURNOUTS LISTED IN THE TABLE HAVE THE FROG CURVED AND THE SWITCH CURVED BACK OF PLANING: FROG RATIO, 1-3; SECOND AND THIRD OF FROG RATIO 1-4; SECOND, THIRD AND FOURTH OF FROG RATIO 1-5; AND SECOND, FOURTH, SIXTH AND SEVENTH OF FROG RATIO 1-6.

ALL OTHRS LISTED IN THE TABLE HAVE STRAIGHT FROG AND STRAIGHT SWITCH.

Theoretical and Practical Dimensions of Turnouts.

be used. In some cases it is possible to overcome most of the trouble by placing the frog on the center line of track, thus bisecting both the frog angle and the switch angle as to change of direction of moving trains and thereby avoiding the necessity for material reduction in speed. In either case, however, it appears that the use of frogs of a less ratio than one to fifteen is unnecessary, because on account of light curvature the change of direction after passing the switch at proper speed is made without discomfort and in safety, and as frogs of small angle are very costly both to install and to maintain, it appears to be desirable to keep the frog angle as large as is consistent with the conditions that must be met.

In this connection it is proper to invite attention to the difficulties to be met in properly operating switches of extreme length and to the little, if any, advantage that is gained by their use. The standard length of rail is now 33 ft., and the standard weight can be said to be 90 lbs. per yard. The standard length of rails weighing 50 to 60 lbs. per yard was 30 ft. It appears, therefore, that the standard length has not been increased in proportion to the increase in weight and this is one reason why switches 30 ft. in length are not well adapted to ordinary use. Switches of all lengths and angles should be provided with heel blocks to fill the space between the heel of the switch and the stock rail and fit the rails as well as any other splice bar. The stock rail should pass at least 6 ft. beyond the heels of switches so that the ills that are caused by joints placed close together may be avoided. These conditions could not be produced by using rails 33 ft. and switches 30 ft. in length, and as there does not appear to be any reason to expect that the standard length of rails will be increased in the near future, we must consider the reasonable alternative of shortening the switch.

If we use switches 30 ft. in length and permit the heels of them to droop to a noticeable extent, the body of the switch will drag on the plates and the rails will not move into position on either side until they are struck by the wheels of a passing train. This is surely a very undesirable condition, but it is not uncommon when switches of this, or even somewhat shorter, length are used, and the trouble increases as the switches become somewhat worn, so that some remedy without too much sacrifice of the advantages of a small switch angle appears to be necessary.

In some cases a switch 24 ft. in length has been thought to be satisfactory; others have used switches 27 ft. long and have had no trouble as to loss of time, so that it may not be unreasonable or improper to suggest 26 ft. as a suitable length for a maximum limit when fair speed must be maintained. The angle would be approximately one degree and the joint at both heel and toe of switch could be made to clear the joints in the main or stock rails enough to avoid interference and to avoid also a joint in the stock rail opposite the heel of the switch, but the conditions would be much better if the joints in the stock rails could be further removed.

The advantages to be gained from the use of heel blocks are generally recognized. The switch rails need the rigid and ample support at their heels that apparently cannot be supplied in any other way, and if the heel blocks are properly fitted and afford the same support as angle bars and the bolts pass through the holes bored in the body of the stock rails instead of through the holes provided for a splice, the heel of the switch is properly and efficiently supported and there is then no excuse for the "down at the heel" appearance so frequently noted.

It is important that the entire length of the switch be carried on suitable switch plates with a uniform height of riser throughout. It is also important, and particularly so in turnouts of short radius, that the turnout rails be accurately curved. It is very desirable that the lead and turnout rails be cut at the mills to proper length, so that both frog and switch can be spliced to the same rail and the greatest possible rigidity obtained. This practice has frequently been followed and in every case noted the results have been very satisfactory and it has been found to be much easier to keep frogs and switches in proper condition than where lead and turnout rails are spliced. The main track or ladder track shrould be in good surface and accurately lined before guard rails and turnout rails are spiked.

Another matter of importance that merits attention is the fact that all switch rails in being moved or shifted from one position to the other must either be curved alternately throughout their length, as will be the case if firmly and properly held by the splice bars, or they may swing freely, making an angle at the heel, as may be the case if the switch is neglected and the splices are allowed to become so loose that they act merely as hinges. If the splice bars at the heels of switch are drawn down by the bolts to as close and rigid a fit as it is possible to get by the aid of both a hammer and a wrench, and the heel blocks fit both the main or stock rail and the switch or turnout rail accurately and at least three ties intervene between the joint at the heel of the switch and the nearest joint in the stock rail, the switch will be securely held in place and it will be necessary only to maintain these conditions to secure durability and low cost of maintenance. If then the head rod only is applied, the switch rails will move freely and the rigid joint at the heel will produce approximately the same results as if the switch rails were continuous to the frog; but on account of the danger of breakage of some important part it is thought to be desirable to put on more rods and in doing so the common practice is to suppose both switch rails to be straight at all times, or exactly as they are when they are neglected and the splices at their heels are simply hinges, with the result that if these switches do receive proper attention and the splices are kept tight, the additional switch rods that have been put on are too short and the switch rail that should lie straight is drawn in by the tension on the opposite switch rail that should lie in a curve, the gage is crowded by one of the rails and both are strained by the short rods. This may not be quite the right way to state the case, because the switch rods are supposed to be of the same length and the clips or lugs attached to the rails should vary in length according to the section of rail used and their position on the switch, but at a given position on the switch rail the distance from the back of the rail to the center of the hole in the clip or lug should be the same regardless of the section of rail used, so long as the angle of the switch is unchanged.

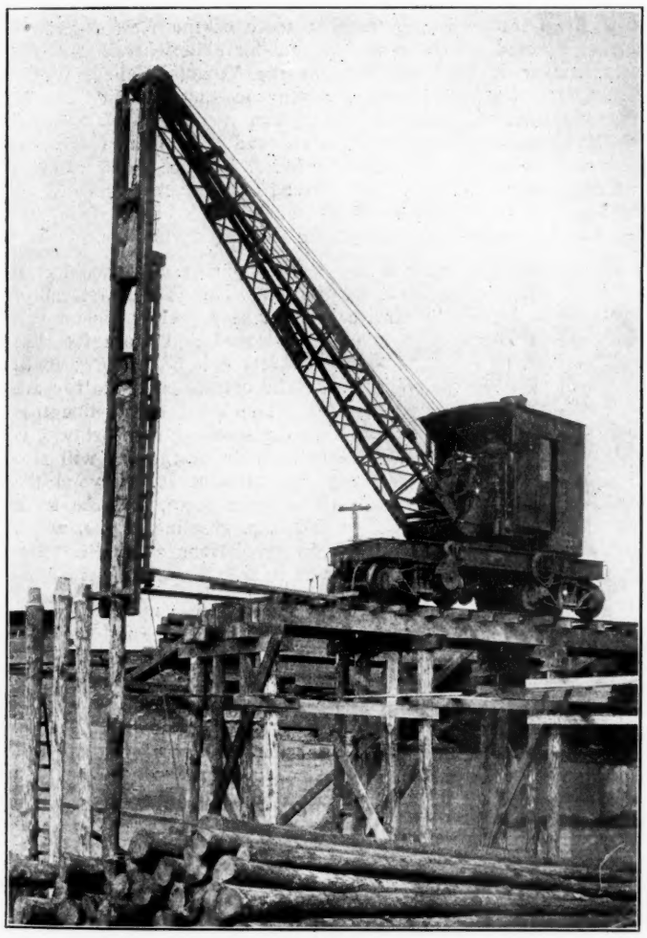
It is evident that to have switches that will work freely and be easy to operate it is necessary that they should work as well with two or three rods on them as with one, and that to secure this result it is necessary that the rods should fit without strain at all times. To accomplish this it is necessary to treat one rail as being straight or a part of the main track and the other as a curve with the line of the switch rail in its working position, a tangent common to both the turnout curve and the switch rail in its curved position. The distance from back of switch rail to center of hole in the lug in all cases should be one-half of the distance remaining after subtracting the distance between centers of holes in the switch rods from the total distance back to back of switch rails, thereby securing an equal distance from back of switch rail to center of hole on opposite sides and making all switch rails of one angle of planing interchangeable. The switch rods back of the No. 1 rod, or the rod near the point of the switch, being generally simply idlers provided to serve in emergencies and incidentally perhaps to relieve the head rod somewhat, add stiffness to the switch as a whole, and insure a more uniform movement of the rails.

The table of turnouts attached was computed by the methods recommended by the Committee on Track of the association.

It is not expected that any one person will make general use of the entire table, or that switches and frogs of all ratios or angles that have been considered will be used by any one person or company, but it is believed that nearly or quite all of them, except possibly a few at the bottom of the list, will be used by someone at some time.

LOCOMOTIVE CRANE ON CONSTRUCTION WORK.

The New York, Chicago & St. Louis has used a Brownhoist locomotive crane extensively for various kinds of work in connection with its track elevation in Cleveland. Among other duties it has used the crane for driving piles. A common pile driver was first used for this, but the contractor believed that this was costing too much, and devised a plan for driving the piles with a locomotive crane by fastening guides to the end of the crane boom and operating it similarly to the regular drop hammer method, as shown in the accompanying view. Two 25-ft. guides are hung from the end of the crane by a bolt and are free to swing back and forth. When driving, the lower end of the guides are held rigid by a brace fastened to the completed portion of the trestle. The piling is securely held in the guides by several cross braces on the back side and by an



Driving Piles with a Locomotive Crane.

iron bar placed across the two hooks at the bottom of the guide in front. The hammer is operated with a single hoisting rope and hook controlled by the operator of the crane. A bolt inserted in one of the guides acts as a trigger for releasing the hammer at the top. The crane hoists the piles up into the guides before driving with the same hoisting rope that operates the hammer, the hammer being held at the top of the guides by a bolt placed through the guides while this is being done. After one bent has been driven the tops of the piles are sawed off and capped and the deck built out, the crane assisting in handling and placing the timbers, ties and the rail.

The road has driven 40-ft. piles through shale 20 ft. into the ground in this manner. The guides are easily and quickly removed from the crane, which is then ready for other work without any change in its mechanism or operation. In one instance, it is said that the guides were removed in four minutes' time.

ECONOMY AND EFFICIENCY IN MAINTENANCE.*

BY F. E. CRABBS,
Roadmaster, C. & N. W., Chicago.

It is not economy to have an insufficient force of labor to keep up your track. If you have not sufficient men to care for the track, it leads to the destruction of your rail and ties, the first most important part of your railway. Bad track also leads to the destruction of your rolling stock and causes derailments. Experience has proven that the practice of making records when laying rail and ballasting is not economical. Comparisons should not be based solely on records of the greatest number of feet laid or surfaced, but also on the thoroughness of the work. Economy will be the greatest in the end on perfect work. It is a great loss to work over sixty men in one gang on reconstruction under traffic. Better results are obtained from smaller gangs. A great saving can frequently be made and better work done, where steel is to be relaid or a general surface made on double track for several miles, by operating a single track during certain hours. If crossovers are too far apart it will often pay to put in a temporary connection for this work and station an operator at such connections during working hours.

It is a practice with most railways when business is slack to decrease the track forces. This is a mistake, as one man will accomplish more in the slack time than one and a half men will accomplish in the busy time, and his work will be done much better. Then, when the busy time comes, one is prepared to handle the business safely, and will be able to decrease the force with resulting economy.

A practical man should be at the head of the track department, and should be authority on all rail to be taken out. In many cases steel is taken from track when it could be made to ride for a few years longer if the necessary help were put on to put the track to surface or, possibly, if new ballast were added.

In a large terminal I find that the work could be done for about one-half if section forces could get the chance to work. Yardmasters will insist that they cannot spare the room and will continue to use a track until some derailment occurs, then they can clear it. Why not clear the track before and save the delay and damage?

The practice of carrying a large surplus of material in each yard or section is expensive and unnecessary. In many cases it is customary to keep a supply of material, such as frogs and switches in each yard. However, it is only necessary to carry one frog of the different weights of rail for emergencies, all other material being ordered on a monthly requisition. Each frog and switch should be carefully inspected frequently, and one which it will be necessary to take out in the next thirty days should be noted and requisition made for a new one.

No roadmaster should ever abuse any foreman or laborer. He should learn to know each foreman, and at the same time give him to understand that he is a foreman and that you are the roadmaster. Talk with him as the superintendent would talk with you. If you have any new work to do, explain to the foreman what is to be done. Then explain how you want it done and any live foreman will have a few ideas of his own. Let him tell them. If they are better or as good as yours, tell him he is right, and he will do more and better work for you than if he had followed your instructions entirely. In this way you always have the good will of your foremen and laborers, also, and you place that confidence in your foremen which means all to both roadmaster and foremen. In other words, get your men to working for your interests, and the company will get results.

A 25-year concession has been granted for the construction and operation of a railway from Rio Grande, Brazil, to Uberaba, as a continuation of the Pontal line.

*From a paper entered in the contest on How the Roadmaster Can Promote Efficiency, which closed July 1, 1911.

General News Section.

Announcement is made that commencing January 1, the Pennsylvania Company will take over the operation of the Cleveland, Akron & Cincinnati.

The Southern Pacific now uses on its Tucson division Mountain instead of Pacific time. The division extends from Yuma to El Paso, 564 miles.

Committees representing the firemen of the Illinois and Missouri divisions of the Chicago & Alton are conferring with the management regarding a new schedule of working conditions and wages.

The Canadian Pacific has decided to adopt oil as a fuel on its line through the Rocky mountains, between Kamloops and Field in the province of British Columbia. Arrangements are being made to make this change in the spring.

At Johannisthal, Germany, on Saturday last, Mr. Suvelack, carrying in his aeroplane one passenger, remained "on the wing" 4 hours and 23 minutes, or more than twice the length of time recorded in the best previous attempt of this kind.

After mediation by the United States Commissioner of Labor, Dr. Charles P. Neil, the southern lines of the Queen & Crescent have granted an increase of wages to locomotive enginemen of approximately 10 per cent. for passenger runners and 7 per cent. for freight.

Passenger train No. 80 of the Atlantic Coast Line was stopped by robbers near Hardeeville, S. C., at two o'clock on the morning of December 12, and the mail car was robbed of its registered packages. The robbers boarded the train at some station, and climbed over the tender, covering the engineman with revolvers before he knew of their presence.

Edward S. Murphy, a chief clerk for the Belt Railway of Chicago, was arrested on December 6 on the charge of embezzling approximately $4,600 of the company's funds during a period of about four years, during which he had been employed, until about two weeks ago, as station agent. His case was continued in the Municipal court until December 22.

On Saturday last, December 9, the Los Angeles Limited of the Union Pacific was run from North Platte, Neb., to Omaha, 291 miles, in 300 minutes. The train arrived in North Platte three hours late and the fast run was made that a sick woman might reach a hospital in time for a surgical operation. Five stops averaging six minutes each were made. Deducting this time from 300 minutes the running time was 270 minutes.

On Saturday night, December 9, the oldest employee of the Maine Central, William Frye of Skowhegan, ended his service for the company. He had worked for the Maine Central and its predecessors 63 years, mostly as sectionman, but for the last 16 years as gate tender. He boasts that there never has been an accident at a crossing which he was tending. He is a native of Ireland, in good health, and hopes to enjoy his pension a long time.

At Toronto, Ont., last week, three employees of the passenger department of the Canadian Pacific were arrested on the charge of stealing from the company several hundred dollars by juggling with claims for rebates on passenger fares. It appears that passengers having unused tickets to be redeemed and who live in places remote from Toronto were defrauded of their rights by protracted correspondence which exhausted their patience; and then, by means of forged signatures and altered vouchers, the thieves were enabled to put the money in their own pockets.

The Southern Pacific is having built at its Oakland shipyards the largest ferryboat in the world, to be run across the Carquinez Straits between Port Costa and Benicia, Cal. The new steamer will be known as the Contra Costa, and will be 433 ft. 4 in. long, by 116 ft. wide, with a tonnage of 3,800 tons. The Southern Pacific already has in service at this strait what is called the largest car ferry in the world, the Solano, built in 1879. The new vessel is only a little larger than the Solano, which carries 48 cars, of the length prevailing in 1879. The Solano was illustrated and described in the *Railroad Gazette* of July 30, 1880.

Congressman Esch of Wisconsin has introduced in the House a bill providing for the valuation of the physical property of all interstate railways, requiring each company to begin the work at once and to make periodical reports to the Interstate Commerce Commission. Representative Roberts of Nevada has introduced a bill to prohibit interstate railways from owning or controlling vessels engaged in trade through the Panama canal. Members of the House committee on interstate commerce have gone to Panama to inspect the canal. A number of bills have been introduced in Congress providing for the abolition of the commerce court.

James Rowan, an employee of the Northern Pacific, passed through New York this week on his way to Ireland for a vacation, which is wholly paid for by his employer; and "Uncle Jim" is such an interesting figure that some of the New York reporters devoted a column to him and his experiences. He is a track walker in the mountains of the Yakima Valley, Washington, and has served the company in that capacity for 32 years, or since the road was built. Ten years ago, while riding on his speeder, a passenger train knocked him off a bridge into the river and he was severely injured, but he pulled through and returned to his work; and instead of suing the company for damages, he thanked the officers for what they had done and said that he should never forget the company's kindness.

The Delaware & Hudson has recently purchased a gas-electric car to be used on its Saratoga division. This is the first car of this kind to be put in service in local passenger traffic on this road and is intended to give an improved and more frequent train service. The car is made of steel; it is 68 ft. long, 10 ft. 5 in. wide and weighs 47½ tons. The entrances to the car are on the sides at about the center. The main compartment is located in the rear of the car, and the smoking compartment is forward of the entrance. The main body of the car will seat 85 passengers and the smoking compartment 16. Beyond the smoking compartment is a small baggage room, and the front end of the car is occupied by a 200 h. p. gasoline engine, which drives an electric generator at 550 revolutions a minute. The car is capable of running 40 miles an hour.

By a lease for 994 years, which has been agreed upon this week, the New York, New Haven & Hartford has divested itself of its interests in the electric and gas lighting properties in a number of Connecticut towns which were acquired some years ago with certain trolley roads. These lighting plants and gas works are situated in Waterbury, Naugatuck, Watertown, Cheshire, Norwalk and Greenwich. These plants, heretofore managed through the Housatonic Power Company, are now leased to a new company, the United Electric Light & Water Company, which has been chartered in Connecticut in the interest, it is understood, of the United Gas Improvement Company, of Philadelphia. The same parties were interested in these properties before they passed to the New Haven road through the Connecticut Railway & Lighting Company. Power stations used wholly or in part for railway purposes are not included in the lease and in some cases will continue to furnish electric current for the properties now disposed of, the prices to be charged for this service being regulated by a clause in the lease. The rental under the lease is to be $365,000 a year. Assuming that this means a capitalization of about $9,000,000, it appears that, according to the estimates of good judges, the property has been transferred at a reasonable valuation. Following the disposal by the New Haven of some of its steamboat interests and of the New York, Ontario & Western Railroad, this is a third important move in a notable policy of contraction.

A Friendly (?) Despatcher.

In a conversation over a telephone between a chief despatcher and a conductor, the chief said: "I wanted to run you through, but they wouldn't stand for it with that light tonnage." The conductor said something, and the chief replied: "Go over your figures again, Tom, and see if you cannot make it 1,900 tons." Tom ran over the figures again and said: "This time I only

make it 1,500 tons." The chief said: "Certainly must be some mistake, Tom. I could do better than that myself. Must be something wrong with your pencil." Then the conductor became aware of what was wanted and said: "Hit me on the bean; that's where I need it most," and that time Tom's tonnage was 1,913, on paper; the 13 tons added to keep off suspicion, although these 13 tons were of cobwebs. The other 400 was a plain steal. And if it was not for the advice of friends I would name that man and his road.—*J. W. James.*

Unfilled Tonnage Report of the Steel Corporation.

The statement issued by the United States Steel Corporation, covering the month of November, shows that the unfilled tonnage on November 30 was 4,141,955 tons. This is an increase of 447,627 tons over the previous month. Orders for new business in November were 39,371 tons a day. Shipments were smaller than in October, indicating that specifications on many of the large orders were delayed. The unfilled tonnage of the Steel Corporation is now larger than it has been at any time since June 30, 1910, when it was 4,257,794 tons.

Postal Car Conference.

The conference committee of the railways, to which was entrusted negotiations with the committee of the postoffice department for the formulation of uniform specification for steel postal cars, met at the New Willard Hotel, Washington, D. C., on December 4. In addition to the committee, representatives of a number of railways were present. A few minor changes were made in the specification as published in the *Railway Age Gazette* of November 24, 1911, page 1049, and it was then approved for submission to the representatives of the postoffice department.

At a meeting of the representatives of the railways with those of the postoffice department on December 5, the chairman of the latter committee made a statement reviewing the previous action and the chairman of the conference committee of the railways, C. A. Seley, stated the process by which the proposed specification had been reached.

It is understood that after the representatives of the postoffice department have considered the specification, as revised, they will desire another conference with the representatives of the railways, at which time a standard interior arrangement will be further discussed. A report of progress covering the principal business of the meetings of December 4 and 5 will be given in more detail, together with a list of the roads authorizing the committee to represent them, in a bulletin from the committee on relations of railway operation to legislation, which we expect to publish next week.

The Comfort of Passengers on the Lehigh Valley.

The "passenger efficiency inspector" of the Lehigh Valley Railroad, recently appointed, is charged with duties supplementing those of the trainmasters. His work has more to do with the comfort of passengers—the little things that make the difference between a pleasant and an unpleasant journey—than with the mechanical or more "strictly business" phases of train operation. An officer of the road writes:

The person who holds this place was formerly inspector of passenger transportation. Then, however, his work was largely of a routine kind, and he stayed in the office a great part of the time. Now he is on the road continually. His duties have a considerable range and do not follow any fixed groove. He is supposed to exercise discretion in observing the conditions of passenger transportation and in giving directions to employees. In a way he is a sort of traveling instructor.

The trainmasters are not able to do this sort of work with the same detail as the new man. They have a multitude of other duties. Their time is partly taken up by freight trains, and it is impossible for them to attend to the intimate details which mean so much to the passengers.

The passenger efficiency inspector covers the entire road, main line and branches. He reports to the division superintendent any infraction of rules that he notices or any condition which seems undesirable, and also sends a copy of the report to the general manager. His work is such that it is of particular interest to the higher officers, and they are observing the working of the scheme closely.

The traveling inspector is by no means a detective. His inspection is quite open and he is clothed with authority to admonish conductors or trainmen when he finds them derelict. If he finds a car overheated, or underheated, or dirty; if he finds that for some reason or other it is not running smoothly; if he sees a trainman or conductor speaking to a passenger roughly or indifferently—any of these is an occasion for his attention. He may notice that baggage is being unloaded too slowly at a station, owing to the indolence of the baggagemaster, in which case he admonishes the offender to move more energetically and not to repeat the slow performance.

The higher officers of the company are much pleased, so far, with the results of this experiment. Undoubtedly, it has created an incentive for the passenger train crews which did not exist before. It is, in fact, additional inspection, since the trainmasters are just as busy as they ever were.

Peace with English Railway Employees.

Press despatches of December 11 report that the conferences between the directors of the railway companies and representatives of the employes' unions which have been held since the strike of a few months ago have resulted in a peaceful settlement; and that the basis of the settlement is substantially the same as that which was recommended in the report of the Royal Commission. The unions did not get complete recognition, but the leaders think that they have made some little progress in that direction. Access of the workmen to their employers concerning matters in dispute is much facilitated.

The agreement accepts the Royal Commission's scheme subject to the following changes:

Deputations are to be received within a fortnight after the receipt of a petition from the men for an increase of wages; the percentage of signatures requisite for validating the petition is not to be fixed at 25 per cent. unless the companies and the men disagree as to the number required; in the event of the companies proposing to alter wages or hours of work the employees are to be notified by circular at least a month before the proposed change.

The first meeting of the board of conciliation under the revised scheme will not be held before May, 1912. The pay of extra men employed in the freight department is to be at a rate per hour not below the minimum paid to permanent employees.

Japanese Version of "How To Be a Good Trainmaster."

To give his life as an atonement because the Emperor of Japan had to spend an hour in a common waiting-room, Moji Shijiro Shimidzu, a trainmaster, threw himself under a train. Shimidzu had been in charge of arrangements of a journey the Emperor made from Kyushu, after witnessing the army maneuvers. The imperial train was delayed by a derailment at a misplaced switch. Shimidzu left a letter saying that he considered it his duty to pay for the Emperor's embarrassment with his life. The Emperor was much distressed when the incident was reported to him.—Press Despatch.

[The sociologist would characterize as an "adverse selective influence" the spirit which prompts a man with high ideals to deprive the world of his services. Suicide may be a delicate compliment, but it doesn't move trains.]

Proposed Illinois Central Terminal Improvements in Chicago.

Plans which include the erection of a new passenger terminal station by the Illinois Central in Chicago within five years and a complete rearrangement of its terminal right of way, and which also contemplate electrical operation at some future date, was made public in a message by Mayor Harrison to the city council on Monday night.

The Illinois Central and the Board of South Park Commissioners have signed a contract by which the railway is to surrender to the park board all its riparian rights to the shore of Lake Michigan between Park Row and Fifty-first street, nine-tenths of which is now owned by the railway, and in turn receives additional land to permit of a widening and straightening of its terminal trackage. The present passenger station on Park Row is to be razed and the land occupied, as well as several acres of made land to the east of it, conveyed to the park board, as an addition to Grant park to be used in part as a site for

the Field Museum. The new station is to be erected south of Twelfth street on Michigan avenue, fronting on Twelfth street.

The agreement is a part of a comprehensive scheme for improvement of the city's lake front, which includes the construction of a parkway by filling in a strip of land connecting Grant and Jackson parks separated from the main land by a lagoon, the extension of Twelfth street as a boulevard 118 ft. wide through to the lake front, and a yacht harbor opposite Grant park.

Under the agreement the railway company cedes to the park board all its holdings, except its right of way lying east of Michigan avenue in the block between Park Row and Twelfth street, and all shore land lying east of a defined boundary line extending south to Fifty-first street. The principal benefit received by the railway company through the agreement is a broadened right of way between Thirteenth and Forty-ninth streets. It will have a right of way averaging 400 ft. in width, and in addition, it receives between Sixteenth and Twenty-fifth streets the right to fill in an additional 260 ft., giving room for additional switching facilities south of Twelfth street. When the improvements are completed it is estimated that 65 per cent. of the switching now done north of the Park Row station will be done farther south.

North of the station the plan provides that when the terminals shall be operated by electricity the tracks may be covered over to a width of 50 ft. on the west side between Twelfth and Randolph streets and 50 ft. on the east side between Twelfth and Monroe streets, and the board shall have the privilege of extending the east and west streets for their full width over the tracks between Harmon Court and Monroe street. While no agreement is made regarding the adoption of electricity those who have been instrumental in negotiating the agreement seem to feel confident that this is but the next step in the development of the plan. The execution of the plan requires a settlement of many details, including the approval of the federal government engineers to some changes of the shore line, and of the city council for the vacation of several streets and the cession of some property to the park board.

According to the terms of the contract made public in the Mayor's message, it would appear that the greater benefits are derived by the city. However, the ownership of the riparian rights on the lake front by the railway has long been a source of friction with the city authorities, and it is believed that the public relations of the Illinois Central will be greatly improved. The city and park board officials and the newspapers have expressed a strong appreciation of the spirit of the co-operation displayed by President Markham and the railway officials.

It is believed that the plan may result eventually in locating the stations of all railways entering Chicago on the south on Twelfth street. A tentative plan has already been worked out for the location of the proposed Chicago & Western Indiana terminals and the Lake Shore-Rock Island terminals on Twelfth street, and it is understood that the roads interested in the new union station are also considering the Twelfth street location.

Cost of Carrying Freight Down Hill.

A paper by President F. A. Delano of the Wabash Railroad on "Transportation" was read on Tuesday at the meeting of the National Business Congress, held in Chicago, for the purpose of discussing means of influencing legislation less destructive of business interests. Mr. Delano discussed the nature and development of various kinds of transportation service, incidentally exposing some of the fallacies of the waterway arguments. He said in part:

"Occasionally, we read a wonderful tale of the economy of water transportation. Thus, we are told of a string of coal barges towed with the current down the Ohio and Mississippi rivers from the coal fields in Pennsylvania to the market in New Orleans. The bare cost of such transportation is a mere nothing. It is as if we should compare the cost of moving a 5,000 or 7,000-ton train of cars down grade from the mines to tidewater, as has been done in special cases, with the average cost of operating the railway. The expense of bringing back the boats up the stream is as much an element of the cost of the service rendered as the return of the cars is on the railway. The cost of service the year round, under unfavorable as well as favorable conditions, must be taken into consideration in determining the average cost of any form of transportation.

"That railway managements, like men in other commercial undertakings, realize the force of the principle that 'half a loaf is better than no bread,' goes without saying. It is no argument against a railway corporation that rates in territory parallel to or competing with water transportation are lower than those where such competition does not exist. It would be equally true if the government undertook the manufacture or sale of any commodity without profit or at less than cost; such action would break the price of that commodity; and it is equally true that the manufacturer or merchant who by reason of government competition had to sacrifice a large share of his profit on the sale of some commodities would be compelled to average up by making a larger profit on the remainder of his business."

Boston Dock Commission.

The governor of Massachusetts on December 6 made the following appointments to the new board of dock commissioners, which is to make improvements in the harbor and docks at Boston, planned for by a law under which the sum of $9,000,000 has been appropriated: Hugh Bancroft, Boston, chairman, Joseph A. Conry, Rear Admiral Francis T. Bowles, U. S. N. (resigned). Geo. E. Smith, chairman of the Harbor and Land Commissioners, is a member of the board by virtue of his office, and the fifth member will be named by Mayor Fitzgerald.

President Willard on the Present Railway Situation.

In an address at Baltimore on December 8 at a dinner given by the citizens of Baltimore to the visiting Governors of several western and southern States, Daniel Willard, president of the Baltimore & Ohio, said in part:

Notable among the laws passed by the federal congress is the Interstate Commerce Act, with successive acts amendatory thereto, and I believe it may be fairly said that the Interstate Commerce Act, as it stands today, is sufficiently broad and comprehensive to cover substantially all of the practices originally complained of, and with its administration resting in the hands of an able commission, as is the case at present, it would seem that the people might now feel that their interests have been properly safeguarded, and there is good reason for believing that they do so feel. This is perhaps best shown by the changed attitude of the press. Five years ago, out of 100 articles, taken from as many papers, having reference to the railways, at least 65 would be found to be distinctly hostile to the roads, and the remaining 35 indifferent or merely lukewarm in their support. Now a similar investigation would show at least 90 distinctly favorable to the roads, and practically none opposed. I doubt if record of a more sudden or complete change of public opinion, as indicated by the utterances of the press, can be found, and as far as that goes, it ought to be very gratifying to the railways and their friends, and it is. Unfortunately the solution of a question of such magnitude is not simple, and while under a government such as ours all things must eventually adjust themselves in harmony with public opinion, the period of complete adjustment is frequently somewhat protracted.

The American railway as it is today is the result of private enterprise. It has been built up with funds voluntarily advanced by those who have invested their money in railways, for exactly the same reason that would have prompted them to invest in any other commercial or industrial undertaking; that is, the hope of private gain. There is no inherent difference in principle between the selfishness of the railway stockholder and the selfishness or self-interest of the merchant or manufacturer; both seek to increase their profits and for exactly the same reasons. There is this difference, however—it is now sought to establish a maximum return in the one case, and there is no fixed limit in the other.

Louis D. Brandeis in a recent article in the *Engineering Magazine* wrote as follows:

"To secure successful administration of any railroad, the rewards should be proportioned to the success. The establishment therefore of any rule fixing a maximum return on capital invested in railroads would tend to prevent efficiency by placing a limit on achievement. Today efficiency in management is in danger of being punished whereas it should be rewarded."

He also says:

"Large earnings are frequently accepted as evidence that rates are too high, and invite a demand for reduction, whereas in fact

the large earnings may be due wholly to better judgment, greater efficiency and economy in administration. To take from railroads the natural fruits of efficiency—that is, greater money rewards—must create a sense of injustice suffered, which paralyzes effort, invites inefficiency and produces slipshod management."

While I find myself unable to agree fully with Mr. Brandeis in some things, I am heartily in accord with his views just quoted. The danger he foresees is a very real one.

Today the presence of a surplus above interest and dividend requirements as the result of a year's operation is looked upon in many quarters as evidence of such a degree of prosperity as to justify a reduction of rates, or an increase of wages, or both, and it has come about that the railway is well-nigh unable to effectively resist either. That this condition exists, every railway officer present will, I believe, bear evidence.

Railway development in the past has been, and in the future will be, so long as the existing condition continues, largely a matter of interest on money so invested. The capital requirements for the next five years will not be less than $500,000,000 per year, and we have most excellent authority for believing that they may approach the enormous sum of $1,000,000,000 per annum. The Baltimore & Ohio during its last fiscal year paid out more than $27,000,000 for additional facilities and equipment, or at the rate of over $6,000 per mile of its entire system, and during that period built no new lines whatever. This rate of expenditure, if applied to the 245,000 miles of American railways, would make the enormous aggregate of $1,470,000,000, and if we assume that the Baltimore & Ohio needs were perhaps greater than the average—which may or may not be so—and reduce the amount one half, we still have over $735,000,000—a sum well above the minimum mentioned. In this connection we may well consider the words of one of the able members of the Interstate Commerce Commission, who said:

"We can provide by legislation the sort of cars which a railroad shall use, and the rates which it shall impose; we cannot by legislation force one single dollar of private capital into railroad investment against its will."

The problem, then, which confronts the railways at the present time is, where, and by what means, is to be obtained the great amount of new capital needed to provide the additional facilities and new mileage necessary to properly meet the requirements of a growing country—and when finally obtained, how will the additional obligations for interest or dividends be met? We rather choose the ills we have than fly to those we know not of. In the past the railways have generally been able to raise new capital when needed, because such investments as they offered were supposed to include a reasonable promise of possible large reward. Today the situation is changed. There is little, if any, ground under existing conditions for hope of large reward in connection with railway investments, and even the stability of moderate returns is frequently questioned. When the people decided to exercise their right to regulate—by law provided, they took upon themselves at the same time the responsibilities attending the exercise of that right. There can be no evasion of the responsibility accompanying the exercise of power.

Doubtless the railways were guilty of many, if not all, of the things with which they were charged. Their managers were human and subject to the usual human limitations, but granting to be true all that was urged against them, the roads are necessary, and their development must go on if the country is to grow, as we hope and expect it will. It is a matter of general belief, however, that during the last two or three years railway development has failed to keep pace with the general growth of industrial capacity. What, then, with all this in mind, had best be done? What remedy, if any, is there to suggest? I should feel that I had fallen far short of what might properly be expected of me if, after pointing out the difficulties which I believe to exist, I failed to suggest a possible solution. While the situation, as I view it, is serious, it is by no means hopeless.

Private capital in the past, plus the hope of large reward, which hope, however, was frequently without foundation, has given the American people the greatest and most effective transportation system in the world. The American railway is the largest single industry in the United States next to agriculture, and it has done what no other American industry has done—it has manufactured and sold its output—that is, transportation—cheaper than is done in any other country in the world, and at the same time has paid to its employees wages from two to three times as high as are paid for similar work in any other country, and its capitalization, which is frequently criticized, is less than $60,000 per mile, as compared with:

England	$275,040	Austria	$112,879
Belgium	169,806	Germany	109,788
France	139,390		

The figures I have used are all a matter of public record and can be easily confirmed.

What has been done can be done again. The same spirit and enterprise which produced the railways as we have them today will, under favorable conditions, keep them abreast of the requirements of the future. The men in charge of the railway properties at the present time have nearly all worked their way up slowly from the ranks. They are not ignorant of the changed conditions, nor are they unmindful of the responsibilities resting upon them as quasi-public servants. They appreciate fully the opportunities afforded them by their position, to be useful to the people and communities served by the properties with which they are connected. But who can blame them—who can criticize, if in view of all I have said, they hesitate to recommend expenditures which would add largely to capital liabilities, while feeling uncertain about their ability to meet the increased charges?—a different course would properly mark them as unworthy of their trust. The remedy which I have in mind rests upon no other foundation than the inherent fairness of the American people.

As I have previously shown, public opinion which was almost wholly adverse to the railways a few years ago, is now clearly in favor of a more liberal treatment of the carriers. The people, I believe, are beginning to recognize that a policy, based upon ample and efficient transportation facilities, with such rates and conditions as will permit the roads to pursue a liberal, but not extravagant, programme of maintenance and expansion, is much better for the country as a whole than a policy which is bound to result eventually in a lack of facilities and all that the term implies.

New York Railroad Club.

The fifth annual Christmas entertainment and social reunion of the New York Railroad Club will be held at the United Engineering Societies building, on December 15, 1911, after a brief business session. The programme will include a vaudeville entertainment and supper. Owing to limited accommodations, the attendance will be restricted to actual members. Authority to issue invitations to special guests is reserved to the president of the club.

Canadian Society of Civil Engineers.

The annual meeting of the Canadian Society of Civil Engineers will be held at Montreal, Que., January 24-26, 1912.

Air Brake Association.

The nineteenth annual convention of the Air Brake Association will be held at Richmond, Va., May 7-10, 1912.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.; annual, May 7-10, Richmond, Va.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York; next convention, Seattle, Wash.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill.; annual, June 18-21, Chicago.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September; annual, March 17, Chicago.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Next annual convention, third week in October, 1912, Baltimore, Md.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, Monadnock Block, Chicago; annual convention, March 19-21, 1912, Chicago.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony building, Chicago. Annual convention, June 17-19, Atlantic City, N. J.

American Railway Tool Foremen's Association.—M. H. Bray, N. Y., N. H. & H., New Haven, Conn.

American Society for Testing Materials.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

American Society of Engineering Contractors.—J. R. Wemlinger, 13 Park Row, New York; 2d Tuesday of each month, New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., New York.

Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; annual, June 26, 1912, Quebec, Que.

Association of Railway Claim Agents.—J. R. McSherry, C. & E. I., Chicago; annual convention, May 22, 1912, Los Angeles, Cal.

Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago.

Association of Railway Telegraph Superintendents.—P. W. Drew, 135 Adams St., Chicago; annual, June 24, 1912, New York.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 75 Church St., New York; December 12-13, Louisville, Ky.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.

Car Foremen's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

Civil Engineers' Society of St. Paul.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug., St. Paul.

Engineers Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

Freight Claim Association.—Warren P. Taylor, Richmond, Va.; annual, May 15, Buffalo, N. Y.

General Superintendents' Association of Chicago.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

International Railway Congress.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago.

International Railway General Foremen's Association.—L. H. Bryan, Brown Marx building, Birmingham, Ala.

International Railroad Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio. Convention, August 15, Chicago.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August, Des Moines.

Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York; annual convention, May 14-17, Pittsburgh, Pa.

Master Car Builders' Association.—J. W. Taylor, Old Colony buiuding, Chicago. Annual convention, June 12-14, Atlantic City, N. J.

Master Car and Locomotive Painters' Association, of United States and Canada.—A. P. Dane, B. & M., Reading, Mass.; next annual convention, second week in September, 1912.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

Northern Railway Club.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

Omaha Railway Club.—H. H. Maulick, Barker Block, Omaha, Neb.; second Wednesday.

Railroad Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

Railway Club of Pittsburgh.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.; annual, May 12, 1912, Kansas City, Mo.

Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa.

Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio.

Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

Roadmasters' and Maintenance of Way Association.—L. C. Ryan, C. & N. W., Sterling; September, 1912, Buffalo, N. Y.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

Society of Railway Financial Officers.—C. Nyquist, La Salle St. Station, Chicago.

Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

Southern & Southwestern Railway Club.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

Toledo Transportation Club.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

Traffic Club of Chicago.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

Traffic Club of Pittsburgh.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

Train Despatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 18, 1912, Louisville, Ky.

Transportation Club of Buffalo.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

Transportation Club of Detroit.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; August, 1912.

Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

Western Society of Engineers.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August, Chicago.

Wood Preservers' Association.—F. J. Angier, B. & O., Baltimore, Md.; annual, January 16-18, Chicago.

Traffic News.

The Chicago & North Western has put on a regular line of sleeping cars between Minneapolis and Los Angeles.

George Hodges has been appointed assistant general agent of the American Railway Association, with office at Chicago, effective January 1.

T. C. Powell, vice-president of the Southern Railway, addressed a meeting of the Cincinnati Passenger Traffic Club on December 9 on "Taking the Public Into Our Confidence."

The Southern Railway now runs a sleeping car daily each way through between St. Louis, Mo., and Jacksonville, Fla. Southbound, the train leaves St. Louis at noon and arrives at Jacksonville the next evening at 8:20.

Beginning December 17 the "North Coast Limited" of the Northern Pacific will be run through to and from Chicago over the Chicago & North Western, using the new line of the C. & N. W. recently completed between Milwaukee and Wyeville.

Shipments of deciduous fruits east from California in the season closing November 30 amounted to 12,530 cars, estimated to contain 26,000 lbs. each. This is an increase of something more than 10 per cent. over shipments in the season of 1910.

Sugar merchants in New Orleans estimate that cold weather which prevailed in Louisiana and Texas last week, followed by warm weather, has damaged the sugar crop more than 25 per cent., thus inflicting on the producers losses aggregating many millions of dollars.

Freight tariffs have been filed by the Union Pacific, the Denver & Rio Grande, the Colorado & Southern and the Colorado Midland, effective December 15, making voluntary reductions in a list of about 50 commodity rates out of Denver, applying within a radius of about 200 miles.

During the first seven days of December the Missouri Pacific-Iron Mountain system handled the largest freight traffic of any week in the history of the road, a total loading of 27,580 cars. On Thursday, December 7, a record for local loading in one day was made, a total of 3,698 cars.

The Chicago, Milwaukee & Puget Sound has just taken at Seattle, to be carried to New York, a shipment of 620 tons of copper ores from Alaska. It is said that the shipping of ore to the Atlantic coast was made unnecessary by the congested conditions at the reducing works on the Pacific coast.

Frank T. Scanlan, of the Northern Michigan Transportation Company, was elected president of the Chicago Transportation Association at its recent annual meeting. The other officers elected were: Vice-president, Ray E. Clark; secretary, H. E. MacNiven; financial secretary, George H. Brown, and treasurer, J. W. Betts.

The new "Sunset Limited" of the Southern Pacific, running twice a week between New Orleans and San Francisco, in 70 hours 50 minutes, as announced in the *Railway Age Gazette* of November 3, page 920, went into service December 4. Each train is made up of six new cars built by the Pullman Company. An excess fare of $10 is charged each passenger between the termini and $5 between intermediate points.

Shippers in Oklahoma City received and sold during the twelve months ending the first of December, 800 carloads of bananas. These merchants supply practically the whole of the state of Oklahoma, and the quantity named is double that consumed in that state five years ago. It is estimated that the 800 cars contained 500,000,000 bananas. Most of this fruit comes from Northern Panama and Southern Costa Rica.

The Spokane Chamber of Commerce has petitioned the Interstate Commerce Commission to suspend its recent order reducing distributive class rates from Tacoma, Portland and Seattle to points in Washington, Oregon, Idaho and Montana by 20 per cent., as reported in the *Railway Age Gazette* of December 1, page 1145, pending a final determination of the intermountain cases, involving rates from the east to Spokane and other intermediate western cities.

Six hundred bags of walnuts, weighing 86 tons, were shipped from Shanghai to Minneapolis recently by the ocean and rail lines of the Canadian Pacific Railway, and were carried through in 26 days. The shipment left Shanghai in the Canadian Pacific steamship Empress of India November 7, and arrived at Vancouver November 24. From Vancouver a special train took the nuts to Portal in four days, and from there the Soo Line rushed the shipment to Minneapolis, reaching there on December 2.

The National Baggage Committee, representing organizations in 18 large cities, following a meeting in St. Louis on December 9, wrote to the chairman of the various railway passenger associations, demanding the following regulations in relation to the carriage of baggage: (1) 150 lbs. free; (2) excess per 100 lbs. not over one-eighth first-class fare; (3) minimum charge 25 cents; and, (4), a uniform standard for the size of trunks to be fixed at 45 inches, with a penalty of 5 pounds for each additional inch. They desire to hold conferences with the railway men concerning the proposed rules.

The bill-of-lading frauds brought to light in the southern states last year are now again before the public, by reason of the trial, in the Federal court at Huntsville, Ala., of John W. Knight, member of the firm which was most prominently mentioned in connection with the frauds. The accounts say that the aggregate amount of the frauds discovered by the lawyers was $6,000,000, but the only charge against Knight appears to be that of using the United States mails for a fraudulent purpose. Numerous freight agents testified at the trial that certain bills of lading purporting to represent shipments of cotton had not been signed by them and that the records of their respective offices show no such shipments.

The Public Service Commission's record of passenger train performances on the steam railways of the state of New York for the month of October, just issued, shows that during the month the number of trains run was 63,265. Of the number of trains run, 84 per cent. were on time at the division terminal. The average delay for each late train was 23.8 minutes, and the average delay for each train run was 3.7 minutes. The principal causes of delays were: Waiting for trains on other divisions, 35.0 per cent.; waiting for train connections with other railways, 14.2 per cent.; train work at stations, 13.0 per cent.; trains ahead, 7.7 per cent.; engine failures, 6.2 per cent.; meeting and passing trains, 6.0 per cent.; wrecks, 4.7 per cent.

The Maine Central and the Canadian Pacific have issued orders forbidding employees acting as agents to distribute freight for several parties when the freight comes in a single consignment to one party. A practice had come into vogue of firms in large cities accumulating a carload of goods and shipping it at carload rates to the destination, with some railway employee, preferably the freight agent, as consignee. That consignee would distribute the goods to the different parties who had ordered them, and in some instances the distribution is understood to have involved reshipments. Railway employees at several places in northern Maine had become solicitors of sales for firms making such shipments.

Announcement was made on Monday of a settlement of the controversy between the transcontinental railways over the division of through passenger fares between the Missouri river and the Pacific coast which resulted several weeks ago in the refusal of the Southern Pacific, the Western Pacific and San Pedro, Los Angeles & Salt Lake to continue the then existing through sleeping car routes over the Burlington and the Rock Island. The Interstate Commerce Commission about a year ago ordered a reduction in the local passenger fares between Salt Lake and Ogden on the east and San Francisco and Los Angeles on the West, whereupon the Burlington and the Rock Island demanded that the new rates be made the basis of the division of the through rates. The western lines insisted on the old division, which gave 50 per cent. to the lines east and 50 per cent. to the lines west of Ogden and Salt Lake; and, on the refusal of the eastern lines to continue the old rates suddenly served notice of the discontinuance of through service. It is now announced that a compromise has been reached and that the through car lines affected (to and from Chicago and St. Louis) will be restored at once.

Members of the Illinois Manufacturers' Asosciation held a meeting on December 8, in Chicago, to protest against the new class rates applied on through freight from Central Freight Association territory as proportions between Mississippi and Missouri river points, which become effective on December 30, under the recent order of the Interstate Commerce Commission in the Burnham-Hanna-Munger case. The protest was based on the claim that the rates discriminate against shippers and industries in Illinois by placing them at a disadvantage of five cents per hundred pounds first class, four cents second class, three cents third and fourth classes and two cents fifth class, as compared with shippers in places east of the Illinois-Indiana state line and those on the Missouri river. The commission's order prescribes a scale of class rates based on 55 cents first class. In a previous decision the commission had reduced the 60-cent first class rate to 51 cents. At the meeting a recommendation was made that the board of directors of the association ask the commision to restore the rates to their old basis. The St. Louis Business Men's League has asked the roads to apply the same reduction locally from Chicago and St. Louis to the Missouri river as is applied by the commission on through traffic.

The bill to greatly increase the powers of the California State Board of Railroad Commisisoners, referred to in our issue of December 8, page 1181, gives the commission jurisdiction over street railways, pipe lines, gas companies, electric light and power companies, telegraph and telephone companies and water companies, as well as railways, express companies and sleeping car companies. It is proposed that the commission consist of five members instead of three, to be appointed by the governor. Present members will serve out the terms for which they were elected, but new members will serve for a term of six years. One section of the bill provides that public utilities corporations chartered in other states, not already doing business in California, shall not be allowed to do business in the state. The powers of the commisison over railway rates as proposed are in many respects similar to those of the Interstate Commerce Commission, but the commisison is also empowered to fix rates, compel adequate service, equipment and facilities, to order improvements and additions and changes in equipment, to order track connections between steam railways and electric railways, and to require the maintenance and operation of safety devices. It is authorized to make a valuation of all property of public utility companies and such companies are required to furnish the commission with data bearing on this subject and to keep accounts in such form as the commission may direct. The bill also includes a provision requiring a certificate of public convenience and necessity from the commission for the construction of any new plant or extension.

Revenues and Expenses in September.

The summary of revenues and expenses of steam roads in the United States for September, prepared by the Bureau of Railway Economics, shows that the railways whose returns are included operate 227,272 miles of line, or about 93 per cent. of all the steam railway mileage in the United States. The total operating revenues for the month of September, 1911, amounted to $245,914,342. This includes revenues from freight and passenger traffic, from carrying mail and express, and from miscellaneous sources. Compared with September, 1910, the total operating revenues of these railways show an increase of $161,730. That this increase was due exclusively to the increase in mileage of these roads in 1911, as compared with 1910, is proven by the fact that when reduced to a per mile basis for the two years, total operating revenues show a decrease. Thus total operating revenues per mile of line amounted to $1,082 in September, 1911, and $1,097 in September, 1910, a decrease for 1911 of $15, or 1.4 per cent. This decrease in operating revenues resulted from a decrease in freight revenue of $12 per mile, and in passenger revenue of $5 per mile.

Operating expenses, which include all the costs of maintaining track and equipment, operating trains, securing traffic, and of administration, amounted to $156,997,223. This was $974,474 less than for September, 1910. Operating expenses per mile amounted to $691, compared with $705 in September, 1910. This represents a decrease of $14 per mile, or 2.0 per cent., which was due to decreases in all the primary operating expense accounts except that of maintaining equipment. In the cost of maintaining way and structures, i. e., track and buildings, there was a decrease compared with September, 1910, of $6 per mile,

or 4.2 per cent., while the cost of conducting transportation declined $7, or 2.1 per cent.

Net operating revenue, which is total operating revenues less operating expenses, shows a decrease as compared with September, 1910, of nearly $1 per mile, or 0.1 per cent. By cutting down operating expenses the railways have been able largely to overcome the decrease of $15 per mile in operating revenues. The net revenue for each mile of line for each day of September averaged $13.04, as compared with $13.06 for September, 1910. It should be recalled that net revenue is gross profit before anything has been taken out for taxes, rentals, interest on bonds, appropriations for betterments, or dividends.

Taxes for the month of September amounted to $9,610,856, or $42 per mile, an increase of 8.5 per cent. over September, 1910.

The operating ratio for September, that is, the per cent. of total operating revenues which was absorbed in operating expenses, was 63.8 per cent., as compared with 64.7 per cent. in August, 1911, and 64.3 per cent. in September, 1910.

The western group of railways show a decrease in total, operating revenues per mile as compared with September, 1910, of 4.7 per cent., and the eastern group a decrease of 0.2 per cent., while the operating revenues per mile of the southern group increased 6.7 per cent. over September, 1910. Operating expenses per mile decreased 1.4 per cent. on the eastern railways as compard with September, 1910, and on the western railways 4.6 per cent., but increased on the southern railways 4.8 per cent. The cost of maintenance of way and structures shows a decrease per mile in every group in comparison with September, 1910. Net operating revenue per mile in the western group declined 4.8 per cent. as compared with September, 1910, while that of the eastern group increased 2.2 per cent., and that of the southern group 10.6 per cent. Taxes increased in all the groups as compared with September, 1910, the increase per mile amounting to 6.3 per cent. in the western group, 7.7 per cent. in the southern group, and 10.8 per cent. in the eastern group.

The returns for the nine months of the calendar year 1911, compared with those of the corresponding months of 1910, show decreases in total operating revenues per mile of 3.1 per cent., and in net operating revenue per mile of 5.5 per cent. The greatest relative decrease in net operating revenue was that of 10.0 per cent. in the western group.

Comparison of the returns for the three months of the fiscal year 1912 with those of the corresponding months of the fiscal year 1911 shows a decrease in total operating revenues per mile of 1.8 per cent., and in net operating revenue per mile of 1.1 per cent. The considerable decrease of 8.8 per cent. in the net operating revenue per mile of the western group contrasts with increases of 4.6 per cent. in the eastern group and 7.9 per cent. in the southern group.

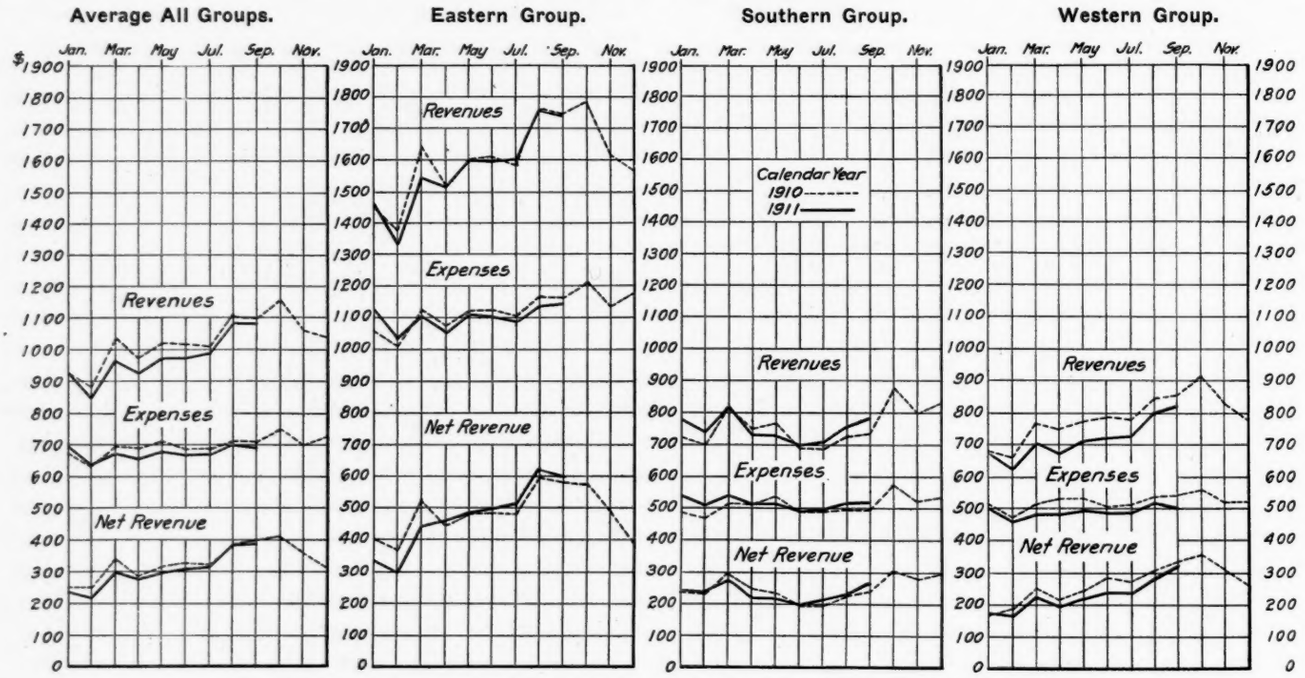
The diagrams show the variations in operating revenues, operating expenses, and net revenue per mile for the separate months of the calendar year 1910 and of the calendar year 1911 to date.

The following table shows the percentage of the various classes of expenses to total operating revenues:

	Sept., 1911.	Sept., 1910.	Fiscal yr. ended June 30, 1911.	Fiscal yr. ended June 30, 1910.	3 mos. ended Sept. 30, 1911.	3 mos. ended Sept. 30, 1910.
Maint. of way and structures	13.3	13.7	13.1	13.4	13.7	14.2
Maint. of equipment	14.4	14.2	15.3	15.0	14.8	14.5
Traffic expenses	1.9	2.0	2.1	2.0	2.1	2.1
Transportation expenses	31.9	32.1	35.5	33.4	32.5	32.5
General expenses	2.3	2.3	2.6	2.5	2.3	2.3
Total	63.8	64.3	68.6	66.3	65.4	65.6

Chicago & North Western Opens New Line.

The new line of the Chicago & North Western through central Wisconsin from Milwaukee to Wyeville, 154 miles, of which a map and description were published in connection with the Milwaukee Belt Railway in the *Railway Age Gazette* of February 24 last, page 354, was opened for the transportation of freight and passengers on Monday, December 11. The line was built under the name of the Milwaukee, Sparta & North Western. It traverses a country part of which has heretofore been without railway facilities and runs through some of the richest and most fertile agricultural lands in the state, including a splendid stock raising and dairying district. The new track connects with the present line at Lindwerm, 8 miles north of Milwaukee, and at Wyeville it connects with the Chicago, St. Paul, Minneapolis & Omaha, for Minneapolis and St. Paul. A further extension from Wyeville to Sparta, connecting with the western lines of the system, is still under construction. By the new line the North Western is given practically a water level route between Lake Michigan ports, Lake Superior ports and the Twin Cities. In connection with the Milwaukee Belt Line means will be provided for running some of the through passenger trains to Duluth and the Twin Cities through Milwaukee by a direct route.

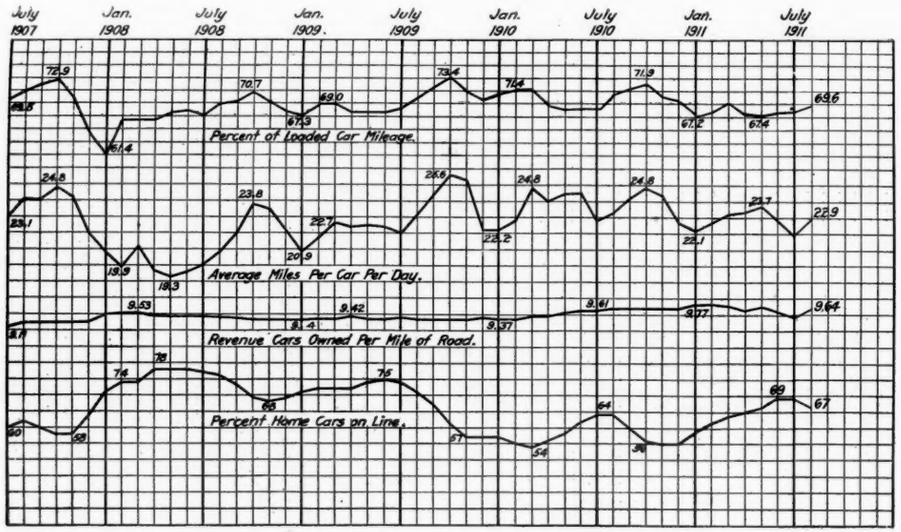


Earnings and Expenses of Railways Per Mile in Each Month of 1910 and 1911.

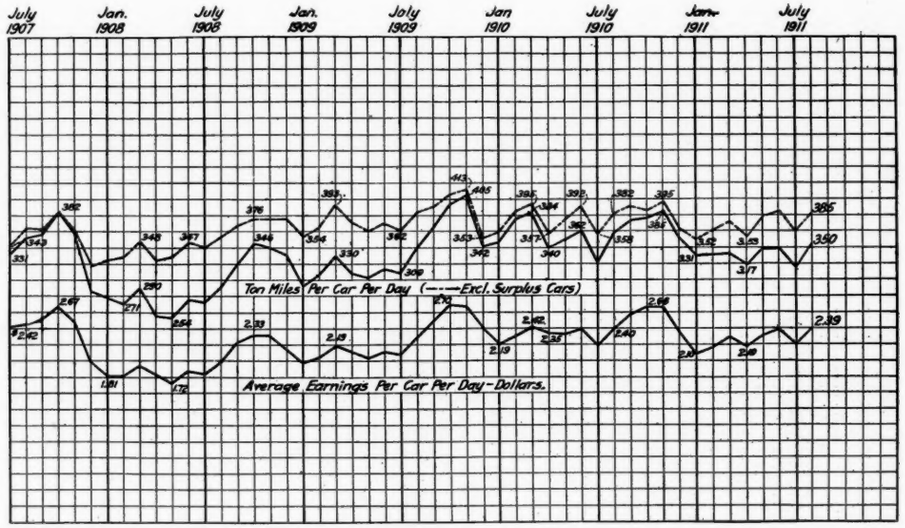
Freight Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 110, covering car balance and performance for August, 1911, says:

"Traffic conditions prevailing during August, 1911, show a



Car Loading and Performance in 1907 to 1911.



Car Earnings and Ton Mileage in 1907 to 1911.

CAR BALANCE AND PERFORMANCE IN AUGUST, 1911.

	New England.	N. Y., N. J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kan., Colo., Okla., Mo., Ark.	Texas, La., New Mex.	Ore., Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Revenue freight cars owned	78,360	497,705	214,695	184,402	170,919	391,349	18,656	136,495	29,699	144,484	107,127	1,973,891
Average number of system cars on line	47,338	335,543	149,742	117,790	113,790	286,854	7,448	95,434	25,519	70,709	76,832	1,326,999
Railway-owned cars: Average foreign on line	36,297	141,429	85,891	50,200	44,582	104,690	11,944	40,411	15,299	52,282	31,725	614,750
Total Railway-owned cars on line	83.635	476,972	235,633	167,990	158,372	391,544	19,392	135,845	40,818	12,291	108,557	1,941,749
Excess	5,275	.....	20,938	.....	.....	195	736	.....	11,119	.....	1,430	.....
Per cent. of cars on line to total owned:												
Home	60	67	70	64	67	73	40	70	86	49	72	67
Foreign	46	28	40	27	26	27	64	30	51	36	29	31
All railways	106	95	110	91	93	100	104	100	137	85	101	98
Private cars on line	3,488	31,212	11,928	2,461	6,068	15,235	1,818	7,902	3,261	10,813	2,638	96,824
Total, all cars on line	87,123	508,184	247,561	170,451	164,440	406,779	21,210	143,747	44,079	133,804	111,195	2,038,573
Per cent. of cars in shop	8.50	9.54	10.32	6.81	9.54	7.58	5.86	9.03	5.64	6.09	8.30	8.59
No. of freight engines owned	1,312	7,723	3,058	3,081	2,660	6,312	525	2,646	816	2,686	2,127	32,946
Average cars on line per freight engine owned	66	66	81	55	62	64	40	54	54	50	52	62
Total freight-car mileage	50,199,262	511,230,845	158,306,768	125,977,945	123,072,468	290,138,738	28,330,201	89,216,051	30,815,540	117,042,382	92,561,837	1,616,892,039
Average miles per car per day	18.6	21.5	20.6	23.8	24.1	23.0	43.1	21.0	22.6	28.2	26.9	22.9
Per cent. loaded mileage	71.5	67.5	68.5	65.6	70.7	71.6	72.7	70.7	69.0	73.0	74.0	69.6
Ton-miles of freight, including company freight	540,207,784	8,152,448,271	2,500,862,293	2,062,773,034	1,701,434,153	2,556,166,606	393,654,117	1,246,964,865	357,931,804	1,707,000,481	1,269,217,674	22,488,661,082
Average ton-miles, including company freight:												
Per car-mile	10.8	16.0	17.0	16.4	14.0	13.8	14.5	14.0	11.6	14.8	13.7	15.0
Per loaded car-mile	15.0	23.7	24.6	25.0	19.8	19.3	19.9	19.9	16.8	20.2	18.5	21.6
Per car per day	200	367	351	390	339	321	654	297	262	416	368	350
Gross freight earnings	$6,161,619	$49,983,386	$14,672,161	$11,370,243	$11,136,314	$29,863,400	$3,097,083	$10,611,293	$3,399,862	$15,983,327	$9,054,527	$165,333,215
Average daily earnings: Per car owned	$2.54	$2.31	$2.20	$1.99	$2.10	$2.46	$5.36	$2.51	$3.69	$3.57	$2.73	$2.47
Per railroad car on line	2.38	2.41	2.01	2.18	2.27	2.46	5.15	2.52	2.69	4.21	2.69	2.51
All cars on line	2.28	2.27	1.91	2.15	2.18	2.37	4.71	2.38	2.49	3.87	2.63	2.39

marked improvement over the preceding month although the performance averages are slightly less than those of August, 1910. With the same per cent. of cars on line, the average miles per car per day increased from 21.9 in July, 1911, to 22.9 in August, 1911, and the per cent. of loaded mileage increased from 67.7 in July, 1911, to 69.6 in August, 1911, indicating the increase in traffic.

"There are also increases in the average tons per loaded car and the tons per car per day, the former increasing from 21.1 in July, 1911, to 26.1 in August, 1911, and the latter increasing from 317 in July, 1911, to 350 in August, 1911. The ton miles per car per day excluding surplus cars show an increase of 25 tons over the preceding month. The average daily earnings of all cars on line increased from $2.17 in July, 1911, to $2.39 in August, 1911, and the same item excluding surplus cars shows an increase of from $2.44 in July, 1911, to $2.61 in August, 1911."

The table on the preceding page shows car balance and performance figures for August and the charts show earnings and performance in 1907 to 1911.

Football Traffic on the New Haven Road.

The biennial Yale-Princeton football game at New Haven on November 18 last was this year for almost the first time affected by rain. It had poured the night before, drizzled through the early hours of daylight, then sprinkled for an hour, and not until near noon did the skies suddenly clear. The influence of the wet weather, as traced in the comparative returns of New Haven railway traffic for 1911 and 1909, are interesting. That traffic, measured in passengers carried, shows an increase from 32,295 to 37,784, or about 18 per cent., while revenue increased from $45,058 to $48,317, or a little more than 7 per cent. The increases were partly due to a larger number than usual of tickets sold at Princeton, but much more to the decrease of automobile travel due to the rain and the muddy roads. This particularly affected the "long distance" automobile travel—as that from New York—as shown by the increased railway business from that city.

The total capacity of the stands at the Yale field is about 33,000 spectators; the total number of automobiles parked outside the field or taken back to New Haven was estimated at 2,000, which at so low an estimate as four persons each, exclusive of chauffeurs, would give 8,000 passengers. This, in a general and indefinite way, indicates the absolute size of the competition with steam railway and trolley.

The company this year again has handled without mishap its great rush of football business on lines where normal passenger business is very intensive. It has four tracks between New York and New Haven, which beyond New Haven divide into two double track lines to Springfield, Mass., and Providence, R. I. But at New Haven its station and track room are pretty meager except as freight sidings can be used; and there is but one double track trolley connecting the station with the city. The schedules will show how well the extra business was handled, especially between New York and New Haven—73.23 miles. Those schedules, with comparative travel and revenue for the two last games, are annexed:

NEW YORK, NEW HAVEN & HARTFORD RAILROAD.

YALE-PRINCETON FOOTBALL SERVICE, Nov. 18, 1911.

Trains from New York to New Haven.

Train.	Left New York.	Arrived New Haven.	Cars.	Passengers.
A	8:04	10:05	12	415
276	8:07	10:17	8	272
B	9:00	10:51	12	633
C	9:12	10:58	12	438
50	9:18	11:19	12	540
D	9:29	11:13	10	259
F	9:25	11:22	10	256
G	9:30	11:28	12	654
H	9:50	11:42	12	886
I	10:10	12:05	12	849
10	10:10	11:47	7	111
12	10:07	12:08	12	583
278	10:06	1:06	6	575
J	10:10	12:12	10	275
K	10:00	12:15	12	910
M	10:20	12:20	10	412
N	10:30	12:33	12	916
PRR. Spl.	....	12:38	4	95
O	10:45	12:49	10	338
P	11:06	12:57	10	392
Q	11:08	1:11	12	1,214
1st 52	11:08	1:19	12	700
2d 53	11:10	1:05	9	229
1st 54	12:01	1:38	6	350
Ex. Spl.	11:35	1:20	8	609
Bpt. R.	....	11:59	12	377
2d 54	12:01	1:50	11	448
Trains from Other Divisions.				
65	....	9:27	8	160
79	....	10.33	10	387
U	....	11:32	12	290
809	....	11:42	7	130
V	....	11:55	12	594
283	....	12:19	11	350
51	....	1:26	11	300
811	....	1:52	5	200
Waterbury	....	11:40	8	173
659	....	9:23	5	120
5	....	11:48	8	155
61	....	12:47	10	244
661	....	1:50	3	85
9	....	1:18	6	47
11	....	1:56	10	200
1105	....	9:15	4	41
1107	....	11:49	6	229
1011	....	9:15	4	53
1031	....	1:22	4	108
1407	....	9:02	2	35
1409	....	1:30	3	100
1411	....	12:18	4	200
				17,937

Trains from New Haven to New York.

Train.	Left New Haven.	Arrived New York.	Cars.	Passengers.
15	4:18 p.m.	6:00 p.m.	5	154
B	4:28	6:23	12	748
A	4:37	6:37	10	603
287	4:39	8:03	6	300
C	4:47	6:43	12	765
G	4:57	7:08	12	1,300
H	5:12	7:10	12	1,300
17	5:20	7:28	12	825
K	5:32	7:25	12	1,233
289	5:41	8:45	6	400
I	5:45	7:50	12	888
D	6:06	7:56	10	277
Q	6:07	8:08	12	838
F	6:11	8:04	10	268
N	6:18	8:25	12	427
55	6:26	8:40	12	267
J	6:24	8:13	10	279
M	6:28	8:35	10	425
O	6:34	8:49	10	325
P	6:41	8:58	10	341
21	6:49	9:02	11	382
1st 57	7:04	9:04	10	165
2d 57	7:20	9:20	12	560
PRR. Spl.	6:43	....	4	93
59	7:56	9:35	9	396
23	8:20	10:00	5	108
25	9:15	11:00	..	386
293	9:38	12:34	6	104
71	12:11	....	12	60
Trains to Other Divisions.				
22	5:53	....	9	340
666	5:24	....	4	210
668	6:17	....	4	110
24	6:45	....	7	63
26	7:24	....	9	210
672	11:30	....	3	96
822	5:03	....	6	452
60	6:13	....	12	350
286	6:28	....	4	195
80	6:56	....	10	140
826	7:22	....	4	110
64	8.14	....	8	190
66	10:15	....	7	287
70	1:19	....	11	65
42	12:50	....	11	30
1028	6:18	....	5	185
1112	6:20	....	4	227
1426	5:45	....	4	250
1430	7:44	....	4	50
1228	12:10	....	5	150
U	5:17	....	11	469
V	5:52	....	11	494
Waterbury Spl.	5:30	....	8	189
				19,079

The super-crowding of three trains leaving New Haven immediately after the game will be noticed. Comparison of travel and revenue follow:

APPROXIMATE REVENUE, YALE-PRINCETON FOOTBALL GAMES, Nov. 18, 1911, AND Nov. 13, 1909.

	1911.		1909.		Increase.	
Special Tickets.	No. Pass'rs.*	Revenue.†	No. Pass'rs.*	Revenue.†	No. Pass'rs.*	Revenue.†
New York	18,570	$28,783	17,844	$26,766	726	$2,017
Bridgeport	1,412	494	1,400	490	12	4
Hartford	740	555	804	603	d 64	d 48
Meriden	600	240	656	262	d 56	d 22
Stamford	412	329	276	220	136	108
So. Norwalk	276	179	270	175	6	3
Springfield	40	52	212	265	d 172	d 213
Other points	268	196	446	329	d 178	d 133
Total	22,318	$30,830	21,908	$29,112	410	$1,717
Excess of reg. business	15,466	13,947	10,387	12,169	5,079	1,778
Total	37,784	$44,777	32,295	$41,281	5,489	$3,496
Parlor and Sleeping Cars.						
New York	.....	$2,457	.....	$2,384	.....	$73
Excess of reg. business	.....	1,082	.....	1,392	.....	d 310
	.....	$3,540	.....	$3,776	.....	d $236
Grand Total	37,784	$48,317	32,295	$45,058	5,489	$3,259

* One-way. d Decrease. † Cents omitted.

The street car traffic in New Haven on the day of the game (October 28), as compared with that of a normal Saturday, increased about 33,000, as follows:

	Nov. 18, 1911.	Oct. 28, 1911.	Inc. or Dec.
Number of revenue passengers carried..	154,810	123,210	i 31,600
Number of transfer passengers carried..	27,940	25,799	i 2,141
Number of free passengers carried.....	1,867	2,040	d 173
	184,617	151,049	33,568

For the Yale-Harvard football game at Cambridge a week later—and including the day before and the day after—the increased earnings of the New Haven road for special trains and cars were $6,847, and for regular travel increase $17,172, a total of $24,019.

Special instruction to train and station men were of the same nature as those in former years, which have been heretofore noticed. Engines under steam were kept attached to wrecking cars at New Haven, Harlem River and Hartford. All of the trains out of New York had to be hauled by electric locomotives, and in nearly every case these engines took the trains through to Stamford, 33 miles. Special arrangements were made to return these engines right to New York the moment they were detached from eastbound trains at Stamford. During the movement of the football trains all freights were required to clear the time of the passenger trains 20 minutes. Conductors were required to have their trains properly made up, lighted and manned for the return trip by 3:30 p. m.

The Cotton Crop.

The United States department of agriculture estimates that the total production of cotton in the United States for the season of 1911-12 will amount to 7,121,713,000 lbs. (not including linters), equivalent to 14,885,000 bales of 500 lbs. gross weight.

The estimated production, with comparisons, by states, follow:

	Pounds Lint.	Bales of 500 lbs., Gross Weight.		
	1911.	1911.		Average 5 yrs.,
States.	(000 are omitted.)	(000 are omitted.)	1910. (Census.)	1905-1909. (Census.)
Virginia	10,957	23	14,815	12,084
N. Carolina.....	445,808	935	706,142	610,268
S. Carolina.....	706,404	1,480	1,163,501	1,068,802
Georgia	1,223,168	2,560	1,767,202	1,765,231
Florida	35,135	73	58,949	58,127
Alabama	765,280	1,600	1,194,250	1,196,571
Mississippi	572,046	1,195	1,262,680	1,387,331
Louisiana	188,810	395	245,648	580,047
Texas	2,051,832	4,280	3,049,409	3,070,723
Arkansas	438,102	915	821,233	816,280
Tennessee	201,054	420	331,947	290,205
Missouri	39,757	83	59,633	48,076
Oklahoma	438,102	915	923,063	734,604
California	5,258	11	5,986	.....
All other	.....	.....	4,158	2,202
United States..	7,121,713	14,885	11,608,616	11,640,551

Drainage Congress Organized.

As the result of a division between the "wets" and the "drys" among those interested in reclamation work, the National Drainage Congress was organized at a meeting in Chicago last week by delegates to the National Irrigation Congress, whose annual convention was in session throughout the week. The new body was organized for the purpose of promoting the reclamation of wet and swampy lands throughout the United States, by methods similar to those favored by the Irrigation Congress in promoting the reclamation of arid lands in the west. Its formation was an alternative to a proposed division of the scope of the older body between irrigation and drainage. The congress will have representation from every state in the Union. E. T. Perkins, of Chicago, was elected first vice-president with executive authority until the next meeting, when a full list of officers will be chosen.

One of the aims of the Drainage Congress will be to advocate the passage of a bill now pending before the federal congress providing for a drainage reclamation fund to be set aside from the proceeds of the sale of public lands. Vice-President W. L. Park, of the Illinois Central, was one of the speakers before the congress, supporting a policy of reclamation by drainage. He said that the question of bringing under subjugation 75,000,000 acres of overflowed lands distributed throughout 40 states was one of the most important before the nation, and promised that the proposed work would be strongly supported by the railways.

"The agency through which this is to be brought about is immaterial," said Mr. Park. "In my opinion, and in that of many others, in order that it may be done quickly, the government should undertake the work and the credit for initiating this movement should go to this organization. It is not paternalism, as some contend, to supply water to the arid lands in the manner in which it has been done under the reclamation act; neither is it paternalism to take from our swamp lands the same water, under the same conditions; on the other hand, it is the wisest public policy.

"The basis of our prosperity lies now, and must always remain, in the soil. Unless we so regard it, disaster is sure to follow. Drainage as a basis of development is only one of the many economic problems our government must take cognizance of. It is, however, the most important at this time."

The National Irrigation Congress elected the following officers for the ensuing year: President, Senator Francis G. Newlands of Nevada; national secretary, Arthur Hooker, Spokane, Wash.; foreign secretary, Dr. E. McQueen Gray, Albuquerque, N. M.; vice-presidents, R. Ensinger, Spokane, Wash.; J. B. Case, Abilene, Kan.; John Fairweather, Fresno, Cal.; S. H. Lea, Pierre, S. D., and Richard F. Burgess, El Paso, Tex.

INTERSTATE COMMERCE COMMISSION.

President Taft has reappointed Commissioner James S. Harlan for a term of seven years.

The commission has suspended until April 3 the proposed advances in rates on lemons, C. L., from California to points in Colorado and the Middle West. It was proposed to increase the rate from $1 to $1.15.

The Omaha Grain Exchange has filed a complaint with the Interstate Commerce Commission alleging unlawful discrimination in the grain rates of the Chicago, Milwaukee & St. Paul railway to Omaha, South Omaha and Council Bluffs, as compared with the rates to Minneapolis.

Conflicting Tariffs.

J. J. Badenoch Co. et al. v. Chicago & North Western. Opinion by the commission:

In a case where conflicting rules which effect a freight rate are published, effective on the same date, in separate tariffs by the same railway, the railway should apply the rule which will result in the lower charge. (21 I. C. C., 36.)

Export Rate on Flour Reduced.

Board of Railroad Commissioners of Kansas et al. v. Missouri Pacific et al. Opinion by Commissioner Harlan:

Carload rates on flour from Glen Elder, Kan., to New Orleans, La., for export found unreasonable. (22 I. C. C., 24.)

No Discrimination Against Laredo.

Board of Trade of Laredo, Tex., v. International & Great Northern et al. Opinion by Commissioner McChord:

Complaint is made that the all-rail rate on all classes and commodities of traffic, except on grain, is higher from eastern seaboard territory and Pacific coast territory to Laredo than to Corpus Christi, San Antonio and other Texas common points. Laredo has been given a Texas common point rate on grain because the orders of the Texas railway commission had fixed intrastate rates in such a way that the convenience of shippers was served by the granting of a through rate, while the railway company did not lose any more money than it did already from the working of the state commission law. At one time the differential to Laredo in other traffic was taken off, but the railway company claims that this was almost at once found to be a mistake and that these differentials were restored as soon as possible. Owing to severe competition between the rail carriers themselves running from Chicago, St. Louis and other points into Texas, and owing to ocean and rail competition from the East via Galveston, the present Texas common point rates are lower then they otherwise would be, and the rates to Laredo are in themselves not unreasonable, the whole contention being that Laredo is discriminated against in favor of San Antonio and Corpus Christi. It is not shown that there is any appreciable competition between Laredo, San Antonio and Corpus Christi. The complaint, therefore, is dismissed. (22 I. C. C., 28.)

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF OCTOBER, 1911.

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama & Vicksburg	142	$98,274	$49,043	$157,300	$21,883	$27,025	$3,916	$51,989	$5,294	$110,107	$47,193	—$136	$4,600	$42,457	—$7,462
Alabama Great Southern	309	293,960	95,089	424,300	38,499	109,357	11,432	122,717	10,461	292,466	131,834	—214	15,048	116,572	3,600
Ann Arbor	291	132,231	43,982	187,534	18,319	19,133	4,299	62,566	7,730	112,047	75,487	1,425	13,986	62,926	2,755
Arizona Eastern	366[1]	107,026	31,674	148,117	23,839	11,458	2,057	41,357	7,228	85,939	62,178	—81	12,560	49,537	1,621
Atchison, Topeka & Santa Fe	7,613[2]	5,465,302	1,893,649	7,979,963	1,222,460	1,142,281	150,803	2,271,414	156,862	4,943,820	3,036,143	.....	328.290	2,707,853	—188,369
Atlanta, Birmingham & Atlantic	661	234,909	60,389	309,478	28,867	48,082	17,204	104,015	8,935	207,103	102,375	.....	16,300	86,075	28,835
Atlantic Coast Line	4,502[3]	1,938,271	637,173	2,782,164	372,166	400,689	46,193	910,401	67,505	1,796,954	985,210	—	107,000	878,210	77,165
Baltimore & Ohio—System	4,433[4]	6,431,698	1,358,001	8,259,823	1,100,751	1,397,778	175,704	2,759,664	153,602	5,587,479	2,672,344	—66,798	241,199	2,364,347	307,560
Baltimore & Ohio Chicago Terminal	77	.....	2,245	153,824	29,300	16,171	1,055	59,300	8,703	114,529	39,295	825	18,206	21,914	1,135
Bangor & Aroostook	627[5]	222,962	64,229	303,322	52,064	31,636	2,986	84,868	10,148	181,702	121,620	.....	9,250	112,370	15,113
Bessemer & Lake Erie	203[6]	876,896	23,498	908,653	71,107	142,434	7,719	196,207	7,718	425,185	483,468	.....	7,000	476,468	117,661
Boston & Maine	2,242	2,439,211	1,381,185	4,115,342	584,910	553,597	47,566	1,711,943	80,358	2,978,374	1,136,968	16,358	178,586	974,740	—5,544
Buffalo & Susquehanna *R. R.*	265	138,179	11,651	154,560	39,863	32,699	1,569	58,695	6,282	139,108	15,452	.....	2,600	12,852	—23,986
Buffalo & Susquehanna *Ry.*	91	47,633	8,811	58,749	8,726	23,461	522	24,589	2,434	59,732	—983	—38	1,400	—2,421	10,221
Buffalo, Rochester & Pittsburgh	572[7]	720,626	85,264	832,569	104,249	162,408	9,444	264,184	16,802	557,087	275,482	229	17,000	258,711	—42,262
Carolina, Clinchfield & Ohio	238[8]	158,343	12,255	174,850	11,799	23,103	4,604	35,216	7,851	82,573	92,277	.....	8,000	84,277	16,889
Carolina, Clinchfield & Ohio of S. C.	17	8,652	1,708	10,637	577	101	923	2,487	443	4,531	6,106	.....	500	5,606	2,189
Central of New Jersey	671[9]	1,832,661	466,729	2,421,638	245,333	322,750	37,335	620,676	36,959	1,263,053	1,158,585	—39,199	94,060	1,119,386	236,196
Central New England	276	270,331	32,640	317,867	52,492	22,054	1,234	77,184	2,140	155,104	162,763	53	9,000	153,816	50,699
Central Vermont	411	242,331	107,028	376,483	50,183	56,549	7,751	151,349	9,569	275,401	101,082	650	12,200	89,532	—23,386
Charleston & Western Carolina	340	156,959	31,785	197,015	28,955	25,236	3,363	60,093	4,070	121,717	75,298	.....	5,000	70,298	20,328
Chicago & Alton	1,025	897,922	395,706	1,397,978	217,839	254,484	43,002	473,276	33,628	1,022,229	375,749	—2,575	36,500	336,674	55,699
Chicago & Eastern Illinois	1,275[10]	1,127,919	245,607	1,471,325	177,670	262,488	29,185	488,232	39,432	996,507	474,818	—1,981	38,500	434,337	31,390
Chicago & Erie	269	399,184	63,804	499,827	93,228	84,508	21,683	216,241	11,589	427,249	72,578	.....	16,450	56,128	—7,278
Chicago & Northwestern	7,761[11]	4,749,504	1,899,032	7,324,406	954,796	894,117	112,363	2,681,496	120,346	4,763,110	2,561,288	801	275,000	2,287,089	318,640
Chicago, Burlington & Quincy	9,074[12]	5,670,979	1,940,949	8,320,216	924,060	1,269,486	118,440	2,511,371	189,872	5,013,229	3,306,985	—1,840	264,445	3,040,700	—556,112
Chicago Great Western	1,496[13]	904,564	259,582	1,252,261	145,952	161,190	45,946	460,045	33,484	846,617	405,644	268	33,037	372,875	40,273
Chicago, Indiana & Southern	359[14]	320,236	26,138	368,328	50,511	70,863	7,780	122,903	8,394	260,451	107,877	—185	13,900	93,792	28,198
Chicago, Indianapolis & Louisville	616[15]	406,106	150,576	610,721	82,293	74,372	19,145	205,624	15,882	397,316	213,405	.....	26,184	187,221	37,300
Chicago, Milwaukee & Puget Sound	2,058[16]	1,245,744	291,462	1,582,690	94,884	116,666	57,901	496,261	20,002	785,714	796,976	26,620	79,335	744,261	106,339
Chicago, Milwaukee & St. Paul	7,511	4,336,492	1,281,020	6,141,525	955,877	780,630	113,187	2,253,265	87,056	4,190,015	1,951,510	—2,380	237,650	1,711,480	—190,616
Chicago, Peoria & St. Louis	255	119,899	34,727	162,625	17,817	31,393	7,363	67,516	6,159	130,248	32,377	.....	4,300	28,077	—8,727
Chicago, Rock Island & Gulf	476[17]	185,979	59,862	263,421	26,159	15,532	9,366	83,207	7,978	142,242	121,179	—224	6,512	114,443	29,113
Chicago, Rock Island & Pacific	7,551[18]	3,913,796	1,648,956	5,924,903	869,116	707,121	153,723	2,116,845	135,866	3,982,671	1,942,232	—11,221	230,222	1,700,789	—42,697
Chicago, St. Paul, Minneapolis & Omaha	1,743	959,327	423,231	1,489,635	143,435	146,343	23,226	537,292	31,403	881,699	607,936	810	69,970	538,726	—97,608
Chicago, Terre Haute & Southeastern	351	148,195	16,922	168,476	24,096	28,483	2,669	48,651	6,884	110,783	57,690	—137	8,700	48,853	.....
Cincinnati, New Orleans & Texas Pacific	337	652,071	138,544	832,937	94,539	194,986	20,518	227,799	18,333	556,175	276,762	—1,635	21,800	253,327	—50,197
Cincinnati Northern	245[19]	100,703	15,958	122,688	21,536	25,824	2,777	45,297	2,880	98,314	24,374	.....	5,700	18,674	4,941
Cleveland, Akron & Cincinnati	344	248,985	73,618	343,393	51,718	54,150	4,624	109,492	4,745	224,729	118,664	.....	19,000	99,664	9,752
Cleveland, Cincinnati, Chic. & St. Louis	2,010[20]	1,830,970	638,949	2,697,279	268,402	463,714	77,639	1,026,280	52,215	1,888,249	809,030	—1,484	100,000	707,546	71,753
Colorado Midland	337	167,343	20,856	203,353	21,888	34,128	6,820	83,449	6,387	151,672	51,681	—562	8,000	43,119	8,207
Colorado & Southern	1,174[21]	604,256	107,623	764,413	86,186	145,829	9,232	233,885	27,093	502,225	262,188	—704	24,700	236,784	—71,983
Cumberland Valley	162	190,911	64,249	268,424	48,769	31,428	4,831	83,581	7,049	175,659	92,765	449	5,141	88,073	—42,899
Delaware & Hudson Co.—R. R. Dept.	851[22]	1,631,498	267,494	1,955,818	151,749	286,558	19,361	631,341	43,071	1,132,080	823,738	—2,729	50,000	771,009	—90,416
Delaware, Lackawanna & Western	930	2,431,522	667,917	3,301,710	401,263	499,869	63,355	964,283	61,199	1,989,949	1,311,761	51,060	178,500	1,184,321	—60,194
Denver & Rio Grande	2,555[23]	1,618,032	488,687	2,193,056	384,665	368,632	56,250	767,898	51,334	1,628,779	564,277	—989	73,000	490,288	—163,350
Denver, Northwestern & Pacific	214	86,647	19,171	110,474	11,873	14,589	2,573	35,269	3,754	68,058	42,416	.....	3,000	39,416	4,438
Detroit & Mackinac	353[24]	72,083	27,576	106,074	21,484	18,256	1,983	33,538	4,027	79,288	26,786	—216	8,100	18,470	—6,322
Detroit, Toledo & Ironton	441	143,666	19,368	173,797	34,156	22,189	2,637	75,089	5,372	139,443	34,354	—16	6,000	28,338	2,964
Duluth & Iron Range	190[25]	904,518	21,860	938,074	90,888	66,002	666	142,538	9,656	307,750	628,324	6,434	38,693	596,065	32,404
Duluth, Missabe & Northern	328[26]	806,426	39,104	856,111	99,381	80,916	1,765	131,408	11,740	325,210	530,901	6,064	34,473	502,492	—102,334
Duluth, South Shore & Atlantic	616[27]	188,119	80,285	283,330	48,403	27,240	9,028	106,102	8,863	199,636	83,694	1,517	18,000	67,211	—6,293
El Paso & Southwestern Co	901	509,829	80,042	620,637	78,323	84,287	11,850	165,600	23,422	363,482	257,155	—2,231	21,076	233,848	10,534
Elgin, Joliet & Eastern	841[28]	847,774	2	891,848	77,342	169,050	4,259	235,613	14,142	500,406	391,442	.....	16,725	374,717	68,686
Erie	1,995[29]	3,379,143	741,731	4,430,668	418,540	727,797	99,621	1,454,105	102,719	2,802,782	1,627,886	14,230	163,026	1,479,090	184,829
Florida East Coast	583	152,957	84,357	270,626	58,784	50,703	5,720	92,770	10,147	218,124	52,502	—303	15,500	36,699	17,229
Fort Worth & Denver City	454	330,538	139,791	493,281	35,990	60,811	7,656	162,228	14,726	281,411	211,870	—1,039	12,000	198,831	—42,051
Galveston, Harrisburg & San Antonio	1,338	667,284	228,824	942,587	111,702	150,715	30,130	350,357	23,522	666,426	276,161	—3,427	30,442	242,292	—7,129
Georgia	307	248,166	79,339	345,322	23,433	44,176	11,805	143,035	9,418	231,867	113,455	.....	2,100	111,355	2,535
Grand Rapids & Indiana	587	286,547	133,066	453,119	44,566	78,108	10,840	179,086	15,337	327,937	125,182	331	22,965	102,548	23,193
Great Northern	7,344[30]	5,456,975	1,249,280	7,112,815	664,570	636,920	91,807	1,659,447	93,120	3,145,764	3,967,051	23,192	281,967	3,708,276	562,408
Gulf & Ship Island	307	110,388	38,283	160,960	24,629	30,692	2,644	45,783	7,864	111,612	49,348	.....	4,370	44,978	—24,319
Gulf, Colorado & Santa Fe	1,603[31]	983,376	290,896	1,343,066	251,556	165,453	25,445	443,612	29,614	915,680	427,386	.....	35,761	391,625	—5,808
Hocking Valley	352[32]	536,502	81,095	656,758	84,239	115,973	8,181	201,658	17,982	428,033	228,725	.....	42,300	186,425	—98,273
Houston, East & West Texas	190	90,865	27,383	124,320	21,890	11,454	1,930	36,917	3,134	75,325	48,995	.....	4,416	44,579	8,187
Houston & Texas Central	789	344,106	187,344	568,629	58,084	98,917	19,934	201,800	19,206	397,941	170,688	—944	24,974	144,770	—127,680
Iowa Central	558	305,689	45,345	363,662	41,220	46,188	7,618	145,228	8,304	248,558	115,104	.....	9,670	105,434	27,743
Indiana Harbor Belt	108[33]	.....	.....	219,508	33,064	26,536	2,534	97,326	7,601	167,061	52,447	3,249	5,500	50,196	—11,352
Kanawha & Michigan	175	279,484	31,376	316,439	49,872	46,217	2,218	90,236	7,205	195,748	120,691	44	9,004	111,731	—4,374
Kansas City Southern	827	619,530	145,320	848,741	78,456	124,158	27,420	265,090	30,224	525,348	323,393	.....	34,612	288,781	—62,629
Lake Erie & Western	886	388,207	71,694	488,256	76,930	93,536	12,988	187,166	10,650	381,270	106,986	.....	19,886	87,100	—1,853
Lake Shore & Michigan Southern	1,775[34]	2,875,941	955,144	4,351,609	442,087	518,288	88,616	1,302,162	64,293	2,415,446	1,936,163	1,332	170,000	1,767,495	663,597
Lehigh & Hudson River	96	137,712	3,885	144,064	17,928	17,102	1,235	43,334	3,881	83,480	60,584	.....	3,500	57,084	5,349

Mileage operated on October 31, 1910—[1] 347; [2] 7,547; [3] 4,492; [4] 4,443; [5] 599; [6] 204; [7] 573; [8] 236; [9] 631; [10] 1,276; [11] 7,692; [12] 9,075; [13] 1,489; [14] 340; [15] 615; [16] 1,910; [17] 470; [18] 7,395; [19] 247; [20] 1,982; [21] 1,247; [22] 819; [23] 2,553; [24] 360; [25] 167; [26] 293; [27] 608; [28] 808; [29] 1,959; [30] 7,274; [31] 1,518; [32] 350; [33] 113; [34] 1,662. — Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF OCTOBER, 1911—(CONTINUED).

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Lehigh Valley	1,431	$2,974,955	$372,679	$3,465,305	$402,034	$585,443	$83,037	$1,135,495	$66,148	$2,272,157	$1,193,148	—$14,501	$106,900	$1,071,747	—$179,890
Long Island	398[35]	315,928	524,518	876,744	175,013	117,838	13,722	404,357	20,202	731,132	145,612	56,441	53,554	148,499	—89,547
Louisiana & Arkansas	255	86,644	17,769	109,671	19,524	16,279	2,350	32,279	4,798	75,230	34,441	.....	3,150	31,291	—959
Louisiana Western	207	94,077	50,852	154,522	18,543	31,810	8,249	52,608	6,968	118,178	36,344	370	6,402	30,312	—44,696
Louisville & Nashville	4,704[36]	3,850,622	1,035,474	5,182,825	691,030	842,734	91,138	1,523,937	89,794	3,238,633	1,944,192	420	148,950	1,795,662	252,918
Louisville, Henderson & St. Louis	199	72,360	36,299	115,312	24,179	13,158	4,282	37,421	3,432	82,472	32,840	458	3,000	30,298	4,691
Maine Central	1,165[37]	637,206	290,092	983,623	199,431	117,252	12,442	335,179	22,644	686,948	296,675	—651	44,245	251,779	—8,754
Michigan Central	1,804[38]	1,949,827	636,707	2,866,021	376,823	310,505	70,326	1,023,345	42,292	1,823,291	1,042,730	1,264	110,000	933,994	399,844
Midland Valley	373[39]	109,224	43,754	162,189	26,372	20,563	3,032	43,177	6,974	100,118	62,071	276	5,484	56,863	—7,595
Minneapolis, St. Paul & Sault Ste. Marie.	1,027	283,272	103,423	422,919	47,668	49,885	10,658	172,364	12,858	293,433	129,486	38	20,570	108,954	57,858
Missouri, Kansas & Texas of Texas	1,345[40]	825,937	403,778	1,297,305	221,625	74,033	25,629	514,084	28,799	864,170	433,135	—182	22,500	410,453	—78,711
Mobile & Ohio	1,114	962,272	129,503	1,146,792	120,771	196,813	34,990	361,917	30,645	745,136	401,656	—969	24,595	376,092	117,270
Monongahela	64[41]	99,559	2,310	103,539	18,316	6,580	475	22,063	1,944	49,378	54,160	.....	4,000	50,160	—908
Morgan's La. & Tex. R. R. & S. S. Co.	404[42]	248,450	110,472	380,783	50,453	52,157	14,565	161,195	12,900	291,270	89,513	—2,425	18,698	68,390	—51,855
Nashville, Chattanooga & St. Louis	1,255	741,012	247,135	1,057,483	163,626	186,471	35,337	378,711	24,337	789,482	268,001	—745	23,816	243,440	2,107
New Orleans & North Eastern	195	297,585	53,691	371,779	31,494	62,954	9,410	136,319	11,450	251,627	120,152	199	9,250	111,101	19,847
New Orleans Great Northern	282	99,923	31,046	140,754	23,763	18,364	2,581	44,663	7,290	96,661	44,093	—114	2,000	41,979	—5,331
New Orleans, Mobile & Chicago	404	129,564	30,633	170,804	24,435	17,051	2,629	48,285	8,293	100,693	70,111	231	4,512	65,830	—1,806
New York Central & Hudson River	3,591[43]	5,818,770	2,649,530	9,454,242	1,394,235	1,490,991	223,123	3,292,835	208,647	6,609,831	2,844,411	11,494	625,803	2,230,102	70,655
New York, Chicago & St. Louis	561	819,553	140,712	1,001,351	110,005	111,057	46,845	400,829	16,698	685,434	315,917	—1,359	44,000	270,558	—61,718
New York, New Haven & Hartford	2,091	2,867,946	2,364,381	5,735,126	710,104	619,567	31,833	2,087,138	196,829	3,645,471	2,089,655	94,459	345,000	1,839,114	—85,250
New York, Ontario & Western	565[44]	593,158	100,526	720,399	113,567	95,996	10,430	287,019	15,337	522,349	198,050	—1,265	17,917	178,868	6,107
New York, Philadelphia & Norfolk	112	233,580	35,861	289,718	28,990	53,983	3,473	107,497	12,352	206,295	83,423	.....	7,500	75,923	13,288
New York, Susquehanna & Western	152	183,374	49,025	259,657	22,419	23,278	1,724	95,474	6,963	149,858	109,799	5,668	17,873	96,594	—10,458
Norfolk & Western	2,004[45]	2,912,765	400,678	3,445,794	450,766	672,339	52,236	1,006,678	63,604	2,245,623	1,200,171	—1,406	115,000	1,083,765	—179,902
Norfolk Southern	607[46]	183,024	75,080	278,227	35,112	30,101	5,603	85,688	13,427	169,931	108,296	—300	7,500	100,496	5,930
Northern Central	472[47]	929,110	208,124	1,201,495	132,652	235,706	16,199	582,528	22,708	989,793	211,702	974	40,336	172,340	60,619
Northern Pacific	6,016[48]	4,819,719	1,406,337	6,604,917	786,217	609,269	95,916	1,845,403	87,301	3,424,106	3,180,811	30,907	330,246	2,881,472	552,892
Oregon Short Line	1,667[49]	1,482,225	430,098	2,037,275	199,088	125,495	33,265	463,587	31,436	852,871	1,184,404	3,507	130,258	1,057,653	94,426
Oregon-Washington R. R. & Nav. Co.	1,890	1,038,999	450,053	1,604,017	188,544	127,938	47,685	507,936	43,153	915,256	688,761	—1,641	131,150	555,970	.....
Pecos & Northern Texas	296	139,100	31,163	178,022	24,557	38,687	2,683	56,608	4,478	127,013	51,009	.....	6,353	44,656	—15,670
Pennsylvania Co.	1,415	3,733,959	726,405	4,877,945	628,726	873,233	82,284	1,562,517	84,790	3,231,550	1,646,395	1,468	173,430	1,474,433	119,090
Pennsylvania R. R.	3,978[50]	10,499,430	2,954,893	14,353,718	1,517,133	2,652,083	194,665	5,013,333	320,667	9,697,881	4,655,837	—74,417	605,931	3,975,489	—90,170
Peoria & Eastern	351[51]	194,012	65,485	280,715	35,698	37,156	5,337	107,813	5,374	191,378	89,337	.....	10,500	78,837	—16,522
Pere Marquette	2,331[52]	1,162,223	328,761	1,609,287	208,848	248,878	34,084	644,448	31,618	1,167,866	441,421	—4,873	56,289	380,259	98,880
Philadelphia, Baltimore & Washington	713[53]	827,466	685,972	1,667,126	217,735	269,281	27,986	653,276	33,373	1,201,651	465,475	.....	50,698	414,777	69,543
Pittsburgh & Lake Erie	215[54]	1,271,216	130,640	1,442,323	170,395	256,222	12,710	313,127	23,001	775,455	666,868	—406	30,530	635,932	—244,869
Pittsburgh, Cincinnati, Chic. & St. Louis.	1,467[55]	2,448,380	684,327	3,533,146	486,699	611,100	74,565	1,220,480	66,685	2,459,529	1,073,617	—735	127,834	945,048	—51,784
Pittsburgh, Shawmut & Northern	240	112,588	7,747	122,431	13,633	27,496	1,092	32,965	3,597	78,783	43,648	.....	1,574	42,074	15,513
Richmond, Fredericksburg & Potomac	83	100,366	74,740	197,611	21,782	22,510	2,896	71,399	5,208	123,795	73,816	.....	1,000	72,816	9,098
Rutland	468	177,609	110,497	320,819	37,132	35,211	6,603	127,504	5,871	212,321	108,498	.....	10,573	97,925	8,310
St. Joseph & Grand Island	319	102,140	40,243	153,834	28,133	15,057	4,892	61,029	5,665	114,776	39,058	176	5,711	33,523	—7,368
St. Louis & San Francisco	4,731	2,574,141	1,022,208	3,855,567	457,060	465,132	92,851	1,239,877	101,361	2,356,281	1,499,286	.....	161,738	1,337,548	142,001
St. Louis, Brownsville & Mexico	509[56]	124,188	54,410	191,535	41,991	11,204	2,984	60,880	8,107	125,166	66,369	.....	4,500	61,869	32,971
St. Louis Merchants' Bridge Terminal	9	.....	299	165,573	21,999	12,060	12,430	77,829	4,602	116,920	48,653	.....	5,700	42,953	—15,736
St. Louis, San Francisco & Texas	243	95,396	34,026	136,238	25,047	14,516	3,459	51,589	4,718	99,329	36,909	.....	921	35,988	25,525
St. Louis Southwestern of Texas	703	335,371	109,894	474,968	46,347	76,033	12,708	163,170	18,354	316,612	158,356	—148	10,000	148,208	29,011
San Pedro, Los Angeles & Salt Lakes	1,113[57]	438,411	262,625	751,512	153,539	160,964	32,990	297,848	17,181	662,522	88,990	—2,708	24,750	61,532	—130,567
Santa Fe, Prescott & Phoenix	364	100,448	34,084	143,473	17,737	12,374	3,210	38,473	5,291	77,085	66,388	.....	2,329	64,059	5,117
Southern	7,088[58]	3,965,968	1,412,275	5,826,118	639,805	938,602	134,189	1,847,499	151,832	3,711,927	2,114,191	15,049	196,774	1,932,466	89,559
Southern in Mississippi	280	80,646	33,326	121,321	22,931	8,495	2,509	40,668	3,415	78,018	43,303	.....	5,442	37,861	9,672
Southern Kansas of Texas	124	113,015	16,102	133,564	27,450	28,482	2,365	41,792	4,009	104,098	29,466	.....	3,535	25,931	—28,046
Sunset	58[59]	70,385	16,326	90,817	6,763	1,671	195	23,121	274	32,024	58,793	.....	3,390	55,403	7,005
Syracuse, Binghamton & New York	80	59,456	34,798	106,996	9,740	7,001	2,606	39,045	2,085	60,477	46,519	.....	6,220	40,299	3,355
Tennessee Central	293	94,524	31,919	134,261	23,509	19,246	5,037	44,928	7,307	100,027	34,234	.....	4,212	30,022	—15,901
Terminal R. R. Ass'n of St. Louis	35[60]	252	254,843	258,605	38,453	18,126	1,007	87,126	6,236	150,948	107,657	3,729	30,980	80,406	—8,236
Texas & New Orleans	458	232,114	95,413	348,937	52,234	80,415	7,365	729,388	8,432	279,834	71,103	114	12,248	58,969	5,982
Texas & Pacific	1,884	1,176,024	421,751	1,732,729	141,606	161,533	30,008	611,305	40,084	984,536	748,193	—8,641	42,579	696,973	130,273
Toledo & Ohio Central	440[61]	419,430	55,771	500,940	85,236	66,884	7,144	161,496	7,593	328,353	172,587	—1,033	25,706	145,848	—28,196
Toledo, St. Louis & Western	450	294,877	36,656	352,150	47,317	71,713	8,437	129,372	8,791	265,630	86,520	.....	14,500	72,020	—53,614
Trinity & Brazos Valley	462	284,199	44,094	337,523	33,859	26,960	9,059	125,257	12,547	207,682	129,841	.....	5,835	124,005	39,119
Union Pacific	3,506[62]	3,606,085	930,616	4,910,679	405,569	479,595	100,506	1,254,813	107,183	2,347,666	2,563,013	2,383	175,100	2,390,246	—213,965
Union R. R. Co. of Baltimore	9	110,675	21,647	133,956	9,773	.....	976	6,005	2,277	19,031	114,925	.....	5,923	109,002	—8,337
Union R. R. Co. of Pennsylvania	31	—	—	439,259	40,801	73,340	100	121,919	2,433	238,593	200,666	3,672	4,000	200,338	69,882
Vandalia	827	609,967	220,184	917,762	121,379	166,800	28,089	336,864	19,564	672,696	247,066	.....	28,301	218,765	—41,208
Vicksburg, Shreveport & Pacific	171	72,428	41,638	124,243	21,496	19,805	2,959	39,027	4,529	87,816	36,427	217	6,300	30,344	—8,989
Virginia & Southwestern	240[63]	133,485	15,481	152,818	16,597	26,184	1,962	43,077	4,300	92,020	60,798	.....	4,710	56,088	19,554
Virginian	474[64]	397,860	21,276	418,962	44,059	69,748	4,858	121,458	7,922	248,035	170,927	6,359	14,000	163,286	38,098
Washington Southern	35	32,432	35,236	88,860	11,980	10,655	1,118	34,369	2,474	60,596	28,264	.....	3,245	25,019	—6,872
West Jersey & Seashore	355[65]	159,886	247,893	446,620	91,237	104,945	14,046	224,803	10,011	445,042	1,578	—474	23,473	—22,369	—127,677
Wheeling & Lake Erie	457	606,059	54,206	708,651	75,418	122,581	8,709	224,713	14,794	446,215	262,436	4,168	30,859	235,745	91,770

Mileage operated on October 31, 1910—[35] 389; [36] 4,500; [37] 1,179; [38] 1,746; [39] 323; [40] 1,348; [41] 64; [42] 348; [43] 3,587; [44] 545; [45] 1,951; [46] 602; [47] 470; [48] 5,815; [49] 1,594; [50] 3,970; [51] 351; [52] 2,337; [53] 717; [54] 191; [55] 1,468; [56] 501; [57] 1,105; [58] 7,038; [59] 56; [60] 34; [61] 444; [62] 3,412; [63] 188; [64] 473; [65] 353. — Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

FOUR MONTHS OF FISCAL YEAR, 1912.

Name of road.	Mileage operated at end of period.	Operating revenues			Maintenance		Operating expenses				Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama & Vicksburg	142	$321,528	$183,792	$544,547	$88,239	$103,812	$15,230	$180,292	$21,098	$408,671	$135,876	—$51	$18,400	$117,425	—$56,337
Alabama Great Southern	309	985,781	426,433	1,543,249	161,871	344,563	42,804	464,810	36,229	1,050,277	492,972	—914	59,592	432,466	20,887
Ann Arbor	291	475,573	224,550	747,918	91,277	72,690	17,881	244,186	29,878	455,912	292,006	6,595	55,942	242,659	60,340
Arizona Eastern	366[1]	456,898	125,843	619,925	95,995	44,369	9,464	165,527	26,276	342,631	277,294	612	34,520	243,386	39,498
Atchison, Topeka & Santa Fe	7,613[2]	19,404,498	7,669,347	29,395,018	5,006,664	4,664,391	605,496	8,380,960	629,255	19,286,766	10,108,252	.....	1,195,172	8,913,080	—1,744,833
Atlanta, Birmingham & Atlantic	661	786,267	252,763	1,092,084	111,102	170,797	65,279	383,939	36,236	767,353	324,731	.....	47,800	276,931	94,257
Atlantic Coast Line	4,502[3]	6,474,672	2,509,813	9,684,142	1,388,698	1,548,650	165,672	3,380,536	279,160	6,762,716	2,921,426	.....	428,000	2,493,426	191,608
Baltimore & Ohio—System	4,433[4]	24,505,419	5,783,571	32,150,795	4,216,613	5,612,696	649,802	10,479,101	641,066	21,599,278	10,551,517	—204,936	967,486	9,379,095	199,159
Baltimore & Ohio Chicago Terminal	77	.....	11,149	560,644	135,868	65,218	3,968	216,556	25,462	447,072	113,572	3,321	72,825	44,068	—9,793
Bangor & Aroostook	627[5]	823,660	255,669	1,145,213	196,577	130,359	14,833	325,385	47,738	714,892	430,321	.....	37,000	393,321	56,614
Bessemer & Lake Erie	203[6]	3,636,123	153,946	3,826,555	317,591	558,517	37,367	803,036	32,045	1,748,556	2,077,999	.....	28,000	2,049,999	354,278
Boston & Maine	2,242	8,836,096	6,405,267	16,413,609	2,519,552	2,114,902	177,379	6,974,020	343,635	12,129,488	4,284,121	89,897	701,643	3,672,375	—347,547
Buffalo & Susquehanna *R. R.*	265	548,740	40,532	611,270	132,591	114,294	5,783	217,906	25,897	496,471	114,799	.....	10,400	104,399	—4,403
Buffalo & Susquehanna *Ry.*	91	173,497	46,093	228,367	26,131	107,647	2,094	93,357	10,284	239,513	—11,146	—282	5,600	—17,028	—30,775
Buffalo, Rochester & Pittsburgh	572[7]	2,834,719	427,044	3,368,834	501,034	619,436	39,577	1,032,625	66,513	2,259,185	1,109,649	1,258	68,000	1,042,907	—192,197
Carolina, Clinchfield & Ohio	238[8]	615,852	60,318	695,885	47,314	88,441	20,138	137,253	31,153	324,299	371,586	1,138	30,000	342,724	151,701
Carolina, Clinchfield & Ohio of S. C.	17	32,888	6,018	39,919	1,921	328	3,747	9,943	1,713	17,652	22,267	.....	2,000	20,267	10,694
Central of New Jersey	671[9]	6,285,642	2,187,752	8,918,775	906,773	1,236,243	133,509	2,462,151	151,085	4,889,761	4,029,014	159,051	376,181	3,811,884	791,622
Central New England	276	924,211	133,997	1,111,646	207,843	81,311	5,080	282,433	9,294	585,961	525,685	256	36,000	489,941	131,299
Central Vermont	411	899,126	476,523	1,487,173	188,253	201,255	31,511	620,860	34,493	1,076,372	410,801	3,741	47,900	366,642	28,803
Charleston & Western Carolina	340	487,511	131,933	650,877	116,170	86,214	11,487	212,077	16,160	442,108	208,769	.....	20,000	188,769	54,556
Chicago & Alton	1,025	3,442,944	1,625,802	5,454,062	847,725	894,088	159,793	1,779,658	127,669	3,808,933	1,645,129	—11,016	146,000	1,488,113	35,323
Chicago & Eastern Illinois	1,275[10]	3,990,442	1,072,297	5,429,806	663,218	954,830	116,281	1,783,143	162,225	3,679,697	1,750,109	—5,746	154,000	1,590,363	—16,097
Chicago & Erie	269	1,427,010	266,395	1,850,866	326,754	330,433	85,302	786,671	39,834	1,574,994	275,871	.....	60,288	215,583	—72,395
Chicago & Northwestern	7,761[11]	17,041,632	7,716,949	27,197,991	3,806,471	3,314,180	474,364	10,045,209	491,546	18,131,770	9,066,221	10,791	1,100,000	7,977,012	243,568
Chicago, Burlington & Quincy	9,074[12]	20,376,609	8,387,838	31,465,144	4,305,575	5,122,473	530,135	9,343,565	747,484	20,049,232	11,415,912	—27,078	1,057,683	10,331,151	252,597
Chicago Great Western	1,496[13]	3,119,411	1,148,063	4,613,828	573,427	626,158	189,721	1,713,597	139,825	3,242,728	1,371,100	761	132,148	1,239,713	86,245
Chicago, Indiana & Southern	359[14]	1,093,196	117,478	1,256,940	179,993	254,044	31,391	448,013	32,970	946,411	310,529	1,826	55,600	256,755	126,678
Chicago, Indianapolis & Louisville	616[15]	1,538,645	627,660	2,370,072	309,531	309,604	73,801	765,765	57,384	1,516,085	853,987	.....	93,684	760,303	30,789
Chicago, Milwaukee & Puget Sound	2,058[16]	4,431,877	1,035,457	5,647,119	387,459	510,217	218,257	1,925,366	71,343	3,112,642	2,534,477	95,202	317,336	2,312,341	87,917
Chicago, Rock Island & Gulf	476[17]	643,105	227,101	937,804	127,580	62,610	38,901	38,902	302,244	31,496	562,833	374,971	—1,001	32,028	341,942
Chicago, Peoria & St. Louis	255	427,209	140,430	597,167	78,424	120,745	29,301	246,475	22,735	497,680	99,487	.....	17,200	82,287	—7,457
Chicago, Milwaukee & St. Paul	7,511	14,920,508	5,572,416	22,643,790	4,011,390	3,098,502	432,307	8,607,376	370,466	16,520,041	6,123,749	31,702	957,882	5,197,569	—1,523,719
Chicago, Rock Island & Pacific	7,551[18]	13,598,075	7,041,674	22,015,385	3,552,627	2,960,839	626,958	8,154,711	555,214	15,850,349	6,165,036	—41,421	850,427	5,273,188	—469,283
Chicago, St. Paul, Minneapolis & Omaha	1,743	3,239,574	1,766,475	5,384,876	861,092	611,222	107,495	1,948,878	121,010	3,649,697	1,735,179	6,317	263,811	1,477,685	—520,132
Chicago, Terre Haute & Southeastern	351	536,222	77,177	627,411	99,262	104,210	11,104	180,012	28,713	423,301	204,110	—125	34,800	169,185	.....
Cincinnati, New Orleans & Texas Pacific	337	2,473,026	606,636	3,239,443	311,909	631,610	78,770	893,819	69,941	1,986,049	1,253,394	86	87,200	1,166,280	—90,365
Cincinnati Northern	245[19]	363,761	92,693	480,980	91,196	95,430	11,506	168,216	11,267	377,615	103,365	.....	21,800	81,565	—8,286
Cleveland, Akron & Cincinnati	344	896,906	318,887	1,301,742	212,888	207,092	16,608	420,047	20,945	877,580	424,162	.....	79,200	344,962	—7,093
Cleveland, Cincinnati, Chic. & St. Louis	2,010[20]	6,951,763	3,014,257	10,851,006	1,153,420	1,569,693	332,742	3,902,199	210,450	7,168,504	3,682,502	—6,061	390,000	3,286,441	1,138,270
Colorado Midland	337	545,913	127,871	733,998	94,064	123,397	28,786	292,861	21,403	560,511	173,487	—821	32,000	140,666	18,848
Colorado & Southern	1,174[21]	2,052,888	623,041	2,859,259	368,105	542,826	43,363	851,217	92,574	1,898,085	961,174	—3,880	98,800	858,494	—136,453
Cumberland Valley	162	711,762	249,891	1,007,853	180,014	118,597	18,936	310,304	28,969	656,820	351,031	1,927	20,565	332,393	—131,475
Delaware & Hudson Co.—R. R. Dept.	851[22]	5,971,032	1,379,747	7,399,833	512,321	1,032,863	93,647	243,530	175,158	4,242,520	3,557,313	—4,430	194,968	3,157,915	279,865
Delaware, Lackawanna & Western	930	9,188,047	2,919,955	12,897,463	1,819,571	1,928,274	262,509	3,612,705	255,058	7,878,117	5,019,346	164,182	644,000	4,539,528	6,477
Denver & Rio Grande	2,555[23]	6,166,046	2,136,471	8,665,304	1,319,705	1,428,471	227,498	2,889,524	194,955	6,060,153	2,605,151	14,574	286,000	2,333,725	—426,150
Denver, Northwestern & Pacific	214	280,892	186,083	487,066	58,465	59,811	11,025	132,088	12,872	274,261	212,805	.....	12,000	200,805	21,857
Detroit & Mackinac	353[24]	264,586	135,740	425,713	78,705	66,325	10,225	130,725	12,005	297,985	127,728	1,698	32,851	96,575	—34,370
Detroit, Toledo & Ironton	441	513,879	68,997	625,497	118,349	79,196	11,090	277,688	22,220	508,543	116,954	4	28,584	88,374	15,362
Duluth & Iron Range	190[25]	3,281,946	87,190	3,952,082	397,397	242,908	3,960	574,522	39,625	1,258,412	2,693,670	22,027	160,326	2,555,371	—395,718
Duluth, Missabe & Northern	328[26]	3,881,282	163,156	4,086,335	419,948	308,555	8,651	562,050	47,503	1,346,707	2,739,628	37,936	169,166	2,608,398	—2,287,120
Duluth, South Shore & Atlantic	616[27]	736,745	383,664	1,179,548	192,937	110,507	40,812	412,213	37,559	794,058	385,490	9,500	72,000	322,990	—59,124
El Paso & Southwestern Co	901	1,818,825	311,838	2,251,704	307,542	340,133	49,019	624,084	89,873	1,410,651	841,053	—6,605	84,303	750,145	—130,411
Elgin, Joliet & Eastern	841[28]	3,121,741	19	3,291,943	293,719	585,219	16,123	895,059	56,919	1,847,039	1,444,904	.....	66,900	1,378,004	455,736
Erie	1,995[29]	12,930,824	3,468,144	17,655,380	2,271,691	2,867,318	389,012	5,427,054	342,154	11,297,229	6,358,151	66,689	575,495	5,851,345	176,155
Florida East Coast	583	489,437	318,734	926,800	219,854	201,337	18,309	371,825	34,417	845,742	81,058	—303	62,000	18,755	—10,124
Fort Worth & Denver City	454	1,051,889	599,858	1,736,105	127,062	238,616	31,901	521,820	52,202	970,791	765,314	—2,894	48,500	713,920	—17,535
Galveston, Harrisburg & San Antonio	1,338	2,561,661	984,902	3,733,972	444,142	539,155	117,258	1,304,234	102,867	2,507,656	1,226,316	18,015	121,768	1,086,533	117,485
Georgia	307	762,049	324,281	1,151,023	102,758	165,079	44,598	469,241	31,942	813,618	337,405	.....	8,400	329,005	94,547
Grand Rapids & Indiana	587	968,827	770,118	1,182,294	183,159	269,296	45,141	711,667	57,623	1,266,886	615,408	—128	91,905	523,375	136,636
Great Northern	7,344[30]	18,445,556	5,359,955	25,409,040	3,066,274	2,513,063	370,018	6,119,476	405,923	12,474,754	12,934,286	110,470	1,135,867	11,908,889	1,898,994
Gulf & Ship Island	307	450,642	153,997	651,830	101,243	122,843	8,548	178,868	30,711	442,213	209,617	.....	18,435	191,182	—26,505
Gulf, Colorado & Santa Fe	1,603[31]	2,855,572	1,111,301	4,210,243	852,897	616,036	102,084	1,500,600	121,800	3,193,417	1,016,826	.....	143,045	873,781	—118,636
Hocking Valley	352[32]	2,154,171	350,903	2,673,709	372,784	409,710	32,679	751,562	62,267	1,629,002	1,044,707	.....	168,315	876,392	—265,468
Houston, East & West Texas	190	298,453	120,392	443,480	76,129	42,375	7,465	130,519	13,450	269,938	173,542	.....	15,542	158,000	—1,926
Houston & Texas Central	789	1,454,735	697,851	2,300,162	283,418	302,917	76,820	800,052	80,570	1,543,777	756,385	—5,002	85,616	665,767	—73,785
Iowa Central	558	975,885	209,357	1,237,984	151,654	189,695	29,060	496,772	32,822	900,003	337,981	.....	38,584	299,397	51,627
Indiana Harbor Belt	108[33]	.....	.....	863,066	104,113	116,072	11,657	367,803	26,184	625,829	237,237	21,731	22,000	236,968	104,049
Kanawha & Michigan	175	1,060,517	130,011	1,212,403	156,236	180,170	9,191	340,651	26,780	713,028	499,375	42	36,551	462,866	—23,511
Kansas City Southern	827	2,235,836	586,591	3,172,305	319,176	444,363	106,335	1,072,226	117,062	2,059,162	1,113,143	.....	138,447	974,696	—253,400
Lake Erie & Western	886	1,509,160	378,392	1,904,587	258,890	326,223	54,015	723,854	43,950	1,406,932	587,655	.....	79,524	508,131	97,211
Lehigh & Hudson River	96	480,633	19,764	509,980	73,739	70,394	4,555	161,624	17,832	328,144	181,836	.....	14,000	167,836	9,612

Mileage operated on October 31, 1910—[1] 347; [2] 7,547; [3] 4,492; [4] 4,434; [5] 599; [6] 204; [7] 573; [8] 236; [9] 631; [10] 1,276; [11] 7,692; [12] 9,075; [13] 1,489; [14] 340; [15] 615; [16] 1,910; [17] 470; [18] 7,395; [19] 247; [20] 1,982; [21] 1,247; [22] 819; [23] 2,553; [24] 360; [25] 167; [26] 293; [27] 608; [28] 808; [29] 1,959; [30] 7,274; [31] 1,518; [32] 350; [33] 113. —Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

FOUR MONTHS OF FISCAL YEAR, 1912—(CONTINUED).

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Lehigh Valley	1,431	$10,995,403	$1,951,747	$13,393,641	$1,517,715	$2,261,431	$335,896	$4,342,497	$264,094	$8,721,633	$4,672,008	—$77,238	$422,500	$4,172,270	$55,089
Long Island	398[34]	1,137,151	3,007,374	4,315,989	519,021	435,153	64,326	1,671,977	79,686	2,770,163	1,545,826	341,936	214,214	1,673,548	126,044
Louisiana & Arkansas	255	337,549	72,902	429,982	93,830	68,499	9,303	117,408	19,035	308,075	121,907	.....	12,700	109,207	—52,299
Louisiana Ry. & Navigation	1,775[35]	10,905,852	4,535,752	17,516,306	1,908,817	2,154,990	360,661	5,100,016	283,483	9,807,967	7,708,339	13,318	575,000	7,146,657	2,271,698
Louisiana Western	207	388,158	210,967	630,904	71,617	111,248	29,689	193,727	27,002	433,283	197,621	—52	25,360	172,209	—62,063
Louisville & Nashville	4,704[36]	13,428,659	4,317,281	18,813,314	2,857,274	3,318,091	364,530	5,712,354	345,316	12,597,565	6,215,749	1,492	595,800	5,621,441	723,130
Louisville, Henderson & St. Louis	199	262,063	155,244	443,641	105,713	47,801	12,258	134,986	12,157	318,275	125,366	1,574	12,000	114,940	5,771
Maine Central	1,165[37]	2,226,047	1,458,526	3,911,327	820,339	425,890	41,724	1,307,396	88,393	2,683,741	1,227,586	—1,025	168,179	1,058,382	94,398
Michigan Central	1,804[38]	6,682,931	3,119,237	10,822,376	1,158,501	1,123,628	280,175	3,815,966	173,837	6,552,107	4,270,269	18,143	440,000	3,848,412	1,483,599
Midland Valley	373[39]	320,206	149,381	500,669	110,540	84,757	13,123	155,312	23,830	387,562	113,107	335	21,937	91,505	3,597
Minneapolis & St. Louis	1,027	1,010,345	485,892	1,622,302	183,057	203,742	42,174	662,185	48,402	1,139,560	482,742	—28	79,046	403,668	—198,961
Missouri, Kansas & Texas of Texas	1,345[40]	2,393,924	1,401,649	4,029,846	901,169	371,911	94,710	1,792,619	112,565	3,272,974	756,872	—4,170	90,000	662,702	—440,325
Mobile & Ohio	1,114	3,117,599	525,458	3,851,027	452,187	713,888	130,592	1,325,258	122,186	2,744,111	1,106,916	—4,448	98,380	1,004,088	87,475
Monongahela	64	378,659	9,354	393,556	70,475	28,072	1,126	88,322	7,773	190,768	202,787	.....	9,700	193,087	2,673
Morgan's La. & Tex. R. R. & S. S. Co.	404[41]	972,136	412,983	1,463,306	196,958	219,363	53,076	580,171	50,490	1,100,058	363,248	—12,087	74,792	276,369	—67,922
Nashville, Chattanooga & St. Louis	1,255	2,743,922	1,070,333	4,082,439	630,502	740,673	144,727	1,468,724	99,577	3,084,203	998,236	—4,198	95,264	898,774	49,221
New Orleans & North Eastern	195	905,679	213,939	1,195,566	114,221	220,445	36,963	420,706	45,356	837,691	357,875	—4,442	37,000	316,433	—34,107
New Orleans Great Northern	282	409,019	125,072	571,169	84,903	71,760	10,607	174,628	27,620	369,518	201,651	—340	8,000	193,311	—31,291
New Orleans, Mobile & Chicago	404	444,627	128,433	610,002	97,612	65,341	10,823	183,532	30,693	388,011	222,001	—110	17,990	203,901	—13,083
New York Central & Hudson River	3,591[42]	20,933,188	12,506,099	37,238,222	5,060,290	5,168,128	812,203	12,537,313	882,822	24,460,756	12,777,466	110,215	1,984,192	10,903,489	1,908,994
New York, Chicago & St. Louis	561	3,059,000	644,819	3,858,943	496,414	401,296	184,872	1,489,446	67,829	2,639,857	1,219,086	3,982	166,000	1,049,104	33,140
New York, New Haven & Hartford	2,091[43]	10,309,791	9,908,457	22,180,322	2,578,087	2,497,954	133,001	7,972,581	646,427	13,818,050	8,362,272	494,113	1,296,000	7,566,385	19,686
New York, Ontario & Western	565[44]	2,380,823	872,217	3,394,140	510,027	520,016	39,686	1,174,533	63,806	2,308,068	1,086,072	4,960	71,667	1,019,365	—177,618
New York, Philadelphia & Norfolk	112	931,679	172,864	1,188,142	129,631	202,168	16,058	437,147	48,834	833,878	354,264	.....	30,000	324,264	—31,979
New York, Susquehanna & Western	152	708,961	218,123	1,033,463	120,233	93,856	7,786	368,631	21,880	612,386	421,077	14,406	71,494	363,989	44,142
Norfolk & Western	2,004[45]	11,346,240	1,652,248	13,469,729	1,765,527	2,460,753	202,354	3,729,399	238,848	8,396,881	5,072,848	—7,169	460,000	4,605,679	142,108
Norfolk Southern	607[46]	635,831	323,173	1,051,851	123,152	129,329	23,772	335,954	51,450	663,657	388,194	—2,687	30,000	355,507	15,427
Northern Central	472[47]	3,248,586	869,113	4,358,235	534,570	827,694	60,834	2,098,643	93,422	3,615,163	743,072	3,432	161,347	585,157	—56,354
Northern Pacific	6,016[48]	15,627,287	6,248,395	23,369,816	3,346,838	2,430,272	392,222	6,791,349	326,973	13,287,654	10,082,162	182,179	1,168,491	9,095,850	—622,469
Oregon Short Line	1,667[49]	5,130,421	1,848,028	7,391,249	949,706	607,123	115,547	1,633,780	136,167	3,442,323	3,948,926	4,340	414,032	3,539,234	—1,379
Oregon-Washington R. R. & Nav. Co.	1,890	3,855,157	1,975,925	6,211,606	823,049	511,342	180,534	1,944,958	159,225	3,619,108	2,592,498	9,549	351,563	2,250,484	.....
Pecos & Northern Texas	296	451,453	122,287	600,912	85,269	120,787	9,084	178,967	18,410	412,517	188,395	.....	16,694	171,701	—28,897
Pennsylvania Co.	1,415	14,411,902	3,235,501	19,128,576	2,374,154	3,228,403	301,772	6,008,795	336,056	12,249,180	6,879,396	—580	690,267	6,188,549	—607,414
Pennsylvania R. R.	3,978[50]	38,589,547	12,574,380	54,591,092	6,086,090	10,283,112	730,321	19,256,634	1,346,294	37,702,451	16,888,641	—423,520	2,423,725	14,041,396	—966,049
Peoria & Eastern	351	756,442	269,008	1,109,237	161,612	154,420	23,741	432,673	22,574	795,120	314,217	.....	42,000	272,217	—86,394
Pere Marquette	2,331[51]	3,857,869	1,698,877	6,045,183	714,217	866,457	154,295	2,488,888	127,332	4,351,189	1,693,994	—10,659	225,047	1,458,288	153,125
Philadelphia, Baltimore & Washington	713[52]	3,300,152	2,715,727	6,623,444	85,893	1,071,816	102,121	2,550,396	142,291	4,720,517	1,902,927	.....	202,791	1,700,136	128,318
Pittsburgh & Lake Erie	215[53]	5,058,629	585,712	5,810,610	610,113	842,906	58,143	1,244,124	93,686	2,848,972	2,961,638	—652	121,060	2,839,926	—569,393
Pittsburgh, Cincinnati, Chic. & St. Louis	1,467[54]	9,401,702	3,001,690	13,880,994	2,054,291	2,433,016	278,580	4,614,634	258,975	9,639,496	4,241,498	—3,896	510,943	3,726,659	39,294
Pittsburg, Shawmut & Northern	240	408,050	38,891	454,547	60,540	97,502	4,397	127,941	14,979	305,359	149,188	.....	6,350	142,837	64,572
Richmond, Fredericksburg & Potomac	83	397,355	277,459	766,963	84,285	105,498	11,349	279,626	22,945	503,703	263,260	.....	4,000	259,260	23,411
Rutland	468	642,185	497,444	1,284,432	161,693	169,121	31,442	475,176	25,417	862,849	421,583	.....	44,764	376,819	—16,858
St. Joseph & Grand Island	319	392,429	168,346	609,314	99,464	67,252	21,216	229,958	21,176	439,066	170,248	206	22,845	147,609	63,849
St. Louis & San Francisco	4,731	8,606,746	4,137,181	13,732,731	1,727,025	1,829,350	354,244	4,616,611	382,381	8,909,611	4,823,120	.....	634,235	4,188,885	18,478
St. Louis, Brownsville & Mexico	509[55]	481,907	229,983	769,856	159,915	47,427	11,419	248,268	32,222	499,251	270,605	.....	18,000	252,605	166,981
St. Louis Merchants' Bridge Terminal	9	.....	1,052	564,894	103,785	37,223	1,767	286,793	20,123	449,691	115,203	.....	22,800	94,403	—138,985
St. Louis, San Francisco & Texas	243	266,834	121,875	416,609	74,106	66,727	12,292	183,211	17,736	354,072	62,537	.....	4,562	57,975	44,593
St. Louis Southwestern of Texas	703	978,692	392,445	1,468,817	179,108	314,767	46,606	532,583	66,342	1,139,406	329,411	—805	40,000	288,606	147,495
San Pedro, Los Angeles & Salt Lakes	1,113[56]	1,698,898	1,097,805	2,979,425	598,454	584,730	125,650	1,120,610	68,229	2,497,673	481,752	—12,512	99,125	370,115	—105,646
Santa Fe, Prescott & Phoenix	364	370,115	139,016	543,189	82,925	53,146	12,077	160,550	21,373	330,071	213,118	.....	13,325	199,973	13,995
Southern	7,088[57]	13,467,117	6,201,316	21,313,300	2,446,623	3,508,462	542,638	7,017,405	584,016	14,099,144	7,214,156	33,016	787,153	6,460,019	365,681
Southern in Mississippi	280	211,022	137,142	378,055	92,006	34,055	9,547	142,583	13,938	292,129	85,926	.....	21,092	64,834	27,547
Southern Kansas of Texas	124	362,258	65,058	444,118	93,457	89,473	8,277	156,041	16,774	364,022	80,096	.....	9,477	70,619	—78,803
Sunset	58[58]	290,362	68,590	373,428	37,235	5,689	260	89,987	1,171	134,351	239,077	.....	13,559	225,518	8,930
Syracuse, Binghamton & New York	80	208,429	157,984	414,950	68,557	24,334	10,865	136,701	9,020	249,477	165,473	.....	24,880	140,593	16,487
Tennessee Central	293	369,447	150,479	550,032	87,766	74,100	20,312	187,530	37,182	406,890	143,142	.....	16,848	126,294	—62,369
Terminal R. R. Ass'n of St. Louis	35[59]	.....	1,015	885,941	142,771	84,510	2,975	297,608	21,955	549,819	336,122	30,268	108,980	257,410	—70,660
Texas & New Orleans	458	859,115	357,786	1,294,595	220,055	224,956	28,216	476,630	35,728	1,005,585	289,010	—1,946	48,992	238,072	—15,197
Texas & Pacific	1,884	3,676,713	1,506,554	5,572,260	609,708	818,136	111,012	2,138,413	167,805	3,845,074	1,727,186	—8,247	156,815	1,562,124	389,455
Toledo & Ohio Central	440[60]	1,605,112	265,401	1,970,247	267,621	235,475	28,396	605,860	32,677	1,170,029	800,218	—3,511	97,462	699,245	—77,950
Toledo, St. Louis & Western	450	1,122,480	181,054	1,389,124	182,030	252,213	34,194	481,590	33,072	983,099	406,025	.....	58,000	348,025	—66,090
Trinity & Brazos Valley	462	626,198	161,414	815,732	115,306	103,684	39,611	340,077	43,078	641,756	173,976	.....	18,670	155,306	148,948
Union Pacific	3,506[61]	12,387,438	3,989,759	17,885,126	1,744,257	1,737,716	427,538	4,476,912	399,743	8,786,166	9,098,960	12,759	646,600	8,465,119	—1,106,157
Union R. R. of Baltimore	9	422,094	84,926	512,690	39,015	.....	3,859	23,024	9,091	74,989	437,701	.....	23,691	414,010	—43,528
Union R. R. of Pennsylvania	31	.....	.....	1,761,415	137,613	328,437	407	520,325	10,535	997,317	764,098	15,901	14,500	765,499	179,243
Vandalia	827	2,216,546	910,983	3,499,669	559,719	645,506	111,200	1,280,706	79,235	2,676,366	823,303	.....	112,304	710,999	106,190
Vicksburg, Shreveport & Pacific	171	248,355	170,730	458,172	81,442	89,129	12,783	145,276	18,471	347,101	111,071	—1,655	25,200	84,216	—56,377
Virginia & Southwestern	240[62]	506,338	61,992	583,139	66,089	107,300	7,363	157,995	15,121	353,868	229,271	.....	18,840	210,431	78,166
Virginian	474[63]	1,434,072	104,246	1,580,778	177,642	270,110	19,961	417,810	31,526	917,049	663,729	20,834	62,600	684,563	180,529
Washington Southern	35	132,078	140,538	358,357	43,763	38,923	4,870	137,169	10,220	234,945	123,412	.....	12,979	110,433	—27,099
West Jersey & Seashore	355[64]	619,734	2,021,040	2,813,737	350,593	422,313	57,120	1,012,998	41,017	1,884,041	929,696	—12,151	93,894	823,651	—127,677
Wheeling & Lake Erie	457	2,402,742	245,687	2,821,833	358,505	465,539	31,111	843,691	54,636	1,753,482	1,068,351	9,260	114,804	962,807	169,880

Mileage operated on October 31, 1910—[34] 389; [35] 1,662; [36] 4,590; [37] 1,179; [38] 1,746; [39] 323; [40] 1,348; [41] 348; [42] 3,587; [43] 2,041; [44] 545; [45] 1,951; [46] 602; [47] 470; [48] 5,815; [49] 1,594; [50] 3,970; [51] 2,337; [52] 717; [53] 191; [54] 1,468; [55] 501; [56] 1,105; [57] 7,038; [58] 56; [59] 34; [60] 444; [61] 3,412; [62] 188; [63] 473; [64] 353. — Indicates Deficits, Losses and Decreases.

Hoarding Coal Cars Forbidden.

Missouri & Illinois Coal Co. v. Illinois Central. Opinion by Commissioner Lane:

The Illinois Central established a rule prohibiting the sending of its coal cars loaded with coal to the lines of certain designated carriers in order to retain on its own line sufficient cars to serve the communities dependent on it for fuel. Complainant attacks the rule as improperly limiting its market as a producer and dealer in coal. The temporary confiscation by carriers of the cars of other railways and the placing of embargoes against cars being sent off of the lines of the owners are alike unlawful and the railways are expected to make such rules for the return of cars as will terminate such abuses.

The railways of the country are called on to so unite themselves that they will constitute one national system; they must establish through routes, keep these routes open and in operation, furnish the necessary facilities for transportation, make reasonable and proper rules of practice as between themselves and the shippers, and as between each other.

An embargo may be justifiable because of the physical inability of the carrier for some reason to deal with traffic which overwhelms it, but an embargo placed against connecting carriers because of their failure to promptly return cars is not consonant with the service which the carriers constituting the through route are required by law to give.

Railways are required under the act to serve the through routes which they have established with other carriers without respect to the fact that in rendering such service their equipment may be carried beyond their own lines.

Carriers are required to make reasonable rules and regulations with respect to the exchange, interchange, and return of cars used upon through routes and for the operation of such through routes, and where they have failed in this respect the commission is empowered to determine the individual or joint regulation or practice that is just, fair, and reasonable. (22 I. C. C., 39.)

Discrimination Against Chicago in Grain Rates.

Rosenbaum Brothers v. Louisville & Nashville et al. Opinion by the commission.

The defendants have made the rule that grain moving from Omaha and surrounding territory to Atlanta and other points in the Southeast, via Mississippi river and Ohio river crossings, not passing through Chicago, would be granted a lower rate than grain from the same point of origin to the same destination which goes through Chicago. This applies on the defendants' lines south of Cincinnati and Louisville. The commission finds that such adjustment is a discrimination against Chicago shippers, Chicago, and the railways participating in the Chicago movement. Reparation is therefore awarded. (22 I. C. C., 62.)

Rebate Through Division of Rates.

In re division of joint rates on coal to points in North Carolina. Opinion by Commisisoner Lane:

A complaint was made by certain coal dealers in Durham, N. C., that one dealer named Mason could sell coal at $5 a ton and make a profit, while the other dealers had to sell it at $6 a ton. Mason paid the same freight rate as the other coal dealers, his plant being at East Durham, which is connected with Durham by the Durham & South Carolina Railroad, the distance being about one mile. Mason's office is on the land of the Chatham Lumber Company, all of whose stock is owned by the Williams & McKeithan Lumber Company. Williams & McKeithan also own the Durham & South Carolina Railroad. Coal sold by all the dealers largely comes from the New River district, and the rates to Durham and to East Durham are the same. The division of rates, however, to East Durham are as follows: The Chesapeake & Ohio hauls the coal 221 miles and gets 81 cents; the Norfolk & Western hauls the coal 116 miles and gets 77 cents, and the Durham & South Carolina hauls the coal one mile and gets 62 cents, a total of $2.20. Mason showed that he could make a small profit because he did his business largely himself and with the help of his sons, and the commission finds that there is no identity of interest between Mason and the Durham & South Carolina Railroad, nor between Mason and either the Chatham Lumber Company or Williams & McKeithan, and no part of the division of rates goes into Mason's pocket, and the reason that he can make a profit at $5 a ton is not in any way connected with the division of rates as between the carriers. The commission, however, wants to know why the Norfolk & Western is willing to allow for so short a haul so large a proportion of the through rate. Durham coal merchants may well argue, but if the Norfolk & Western can afford to pay 62 cents as the division for the one mile haul to East Durham, the through rate of $2.20 to Durham is altogether excessive and unreasonable.

The plain fact is that the Norfolk & Western is paying the Williams & McKeithan Lumber Company, which owns the Durham & South Carolina, an excessive rate for the haul from Durham to East Durham, and thus *pro tanto* reduces the cost to which the lumber company, as a shipper of lumber, is put. Whatever the railway receives from its connection over and above what it is entitled to *as a railway* reduces by just so much the rates on lumber and all else which the Williams & McKeithan enterprise must pay. Mason was solicited to establish himself on the tracks of the Durham & South Carolina by officers of the lumber company, after the Chatham Company had proposed to the Norfolk & Western that it would go into the coal business in East Durham, and had been warned by the traffic manager of the Norfolk & Western that this would be dangerous under the Act to Regulate Commerce. The commission is justified in the belief that the coal business was not seductive to the Chatham Lumber Company, but that it was the fine division of this rate that made this enterprise at East Durham so attractive to the railway owned by the same concern that owned the lumber company.

The record plainly shows that the Norfolk & Western and the Durham & South Carolina are meeting opposition in the cartage of coal to Durham and East Durham, which arises out of an alliance between the Seaboard Air Line and the Durham & Southern. The Durham & Southern is owned and controlled by the same interests that own and control the American Tobacco Company. The Durham & Southern has a remarkable traffic agreement with the Seaboard Aid Line by which the latter surrenders the position of terminal carrier on a large portion of the Durham traffic, both in and out, to the Durham & Southern, which for its 20-mile haul reecives 40 per cent. of the Seaboard's division on through business via the Virginia gateway. The Seaboard Air Line has its own line into Durham and East Durham, while the Durham & Southern has only trackage rights over the Seaboard into these towns. The traffic manager of the Seaboard speaks of this surrender of terminal carrier privileges as a preferential tariff arrangement. There is a short way of stating the proposition. The Seaboard Air Line bought the business of an industry, or of a group of financiers having large traffic at its control, by allowing its traffic at one point to be taken away from it under a management allied to that of the industry. An order is issued against the Seaboard Air Line to show cause why its rates into and out of Durham on all classes and commodities should not be reduced, and against the Norfolk & Western that it show cause why its rates on coal into Durham should not be reduced. (22 I. C. C., 51.)

Conference Rulings.

On inquiry as to the legal propriety of a proposed agreement by an association of general baggage agents providing, in substance, that an intermediate line shall forward to checked destination by the most direct route any baggage received by it not fully routed; that the initial line shall report to the lines actually moving the baggage the amount of any excess baggage charges collected by it; and that in case there is more than one station at destination the initial as well as the terminal line shall be advised of the station at which the baggage may be found, it was held, that, subject to such modified conclusions as may be required in the light of further information, the commission sees no present objection to such rules if properly published in the tariffs.

Telegrams from a shipper relating to his traffic must be paid for by him, but a carrier may lawfully answer such a message at its own expense.

Locomotives while equipped with snowplows or flangers are to be regarded as cars of special construction within the meaning of the order of March 13, 1911.

The order entitled "United States Safety Appliance Standards," adopted on March 13, 1911, is interpreted with respect to the details mentioned as follows: 1. That gondola and ballast cars

with swinging side doors at ladder locations may be considered as cars of special construction.

Ladders and handholds need not be applied to swinging side doors.

A side vertical handhold shall be placed on corner post of such cars, as nearly as possible over sill step.

2. That high-side gondola and ballast cars with end platforms 18 inches or more in length may be considered as cars of special construction.

Ladders shall be placed on such cars as prescribed for high-side gondola and hopper cars, with sill step under ladder, or as near under ladder as car construction, will permit. Ends and side of cars to be equipped with handholds in the same manner as flat cars.

3. Ladders—spacing of ladder treads. That the spacing of top ladder treads shall be taken from eave of roof at side of car, whether latitudinal running board is used or not. (Shown on plates illustrating United States safety appliance standards, issued by the commission July 1, 1911.)

4. Box and other house cars—automobile cars with swinging end doors—end ladders:

That these cars may come under the head of cars of special construction, as per clause on page 37 of the order, and the end ladders placed as nearly as possible to designated location.

Refunds Should Be Made Promptly.

Interstate Grain Co. v. Chicago & North Western et al. Opinion by the commission:

The defendants admitted that an overcharge had been made but claimed that a charge of $2 should be made for reconsignment of certain shipments. The commission takes this opportunity to call attention to the fact that under the act it is as unlawful for a carrier to overcharge a shipper as to give him a rebate. An assumption that overcharges generally arose out of carelessness of some clerk cannot be used as a defense in every case. The increase in the number of cases of overcharges seems to make it advisable that the provision of the law about overcharges should be more strictly enforced, and the commission expects that whenever a formal or informal complaint is submitted to a railway, it will answer at once admitting whether overcharge has been made and give evidence that refund has been effected. (22 I. C. C., 34.)

STATE COMMISSIONS.

The Public Utility Commissioners of New Jersey have ordered the railways of the state to furnish passengers on trains with individual drinking cups, when called for. The law of that state forbidding the use of common drinking cups has been in force several months, but the railways have compelled passengers either to furnish their own cups or, in some cases, to secure them from an automatic delivering device, requiring a payment of one cent for each cup.

The New York Public Service Commission, Second district, holds that a railway company is not required to refund cash fares paid by a holder of a commutation ticket when such person fails to present his ticket for passage. The decision was made on the complaint of J. Heron Crosman of New York City, who complained that at times he had left his New York, New Haven & Hartford commutation ticket at home, had taken a receipt for cash fare paid from the train conductor, and that upon subsequent presentation of such train receipt at a ticket office with his commutation ticket, refund was refused.

COURT NEWS.

The Supreme Court of the United States has sustained the employers' liability law of Arkansas.

The Commerce Court, in a case where they were asked to dismiss because of lack of jurisdiction, held that since the circuit courts had the right of review of any order of the Interstate Commerce Commission involving reparation, the Commerce Court also has that power and can therefore review any order of the I. C. C. involving reparation.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

W. R. Sullivan, assistant to president and assistant secretary of the Atlantic Coast Line, at Wilmington, N. C., has resigned to go with the banking firm of Redmond & Co., New York, effective January 1, 1912.

S. S. Butler, general agent of the St. Louis & San Francisco at New York, has been appointed assistant to vice-president, in charge of all traffic on the Frisco Lines in Louisiana and Texas, with office at Houston, Tex., effective January 1.

The office of auditor of the Cincinnati, Lebanon & Northern will be abolished, effective January 1, and the duties of that office will be assumed by the comptroller, reports of cars and mileage, or per diem reports to be sent to the special agent at Pittsburgh, Pa., and drafts to be made on the treasurer at Pittsburgh.

J. C. Wallace, special examiner of the Interstate Commerce Commission, and previously in the office of the auditor of the Michigan Central, has been appointed auditor of disbursements of the Cleveland, Cincinnati, Chicago & St. Louis, with office at Cincinnati, Ohio, succeeding George N. Wellman, assigned to other duties.

Robert Alfred Brand, who has been elected fourth vice-president of the Atlantic Coast Line, with office at Wilmington, N. C., as has been announced in these columns, was born on December 12, 1858, in Clarendon county, S. C. He began railway work on January 1, 1877, as a clerk with the Wilmington, Columbia & Augusta, and was later telegraph operator and agent at Sumter, remaining in that position until 1894. He was then general agent of the same company and its successor, the Atlantic Coast Line, until August, 1902, when he became general freight agent, and at the time of his recent election, as fourth vice-president, was freight traffic manager of the Atlantic Coast Line at Wilmington, N. C.

Operating Officers.

J. H. Marcy has been appointed superintendent of dining service of the Boston & Albany, with office at Boston, Mass.

J. W. Maring has been appointed assistant superintendent of the St. Louis & San Francisco, with office at Amory, Miss., succeeding W. Rudd, transferred.

D. J. Madden, supervisor of locomotive operation of the Erie Railroad at Cleveland, Ohio, has been appointed trainmaster of the Chicago and Hammond terminals of that road.

J. E. Nelson, trainmaster of the Canadian Northern at Rainy River, Ont., has been appointed superintendent, with office at Port Arthur, Ont., succeeding A. Wilcox, promoted.

T. B. Hamilton, superintendent of the Pennsylvania Lines West at Cleveland, Ohio, has been appointed general superintendent of the new Central division, with office at Toledo.

The line of the Arizona Eastern embraced in and known as the Cochise division has been attached to the Globe division, under the jurisdiction of C. C. Mallard, superintendent, with office at Globe, Ariz.

O. C. Wyman, chief despatcher of the Cleveland, Cincinnati, Chicago & St. Louis at Riverside, Ohio, has been appointed trainmaster of the Cincinnati Northern, with office at Van Wert, Ohio. F. L. Elliott succeeds Mr. Wyman.

C. C. Riley, who recently resigned as general superintendent of the Kansas City Southern, as has been announced in these columns, has been appointed assistant to the general manager of the Baltimore & Ohio, with office at Baltimore, Md.

J. O. Crockett, general manager of the Buffalo & Susquehanna at Buffalo, N. Y., having resigned, that position has been abolished and the duties of that office will, in future, be assumed by E. R. Darlow, assistant receiver, with office at Buffalo.

R. B. Ayres, superintendent of the Eastern division of the Texas & Pacific at Marshall, Tex., has been appointed super-

intendent of the Transcontinental division, with office at Texarkana, Tex., succeeding R. C. Andrews, who has been transferred to the Eastern division in place of Mr. Ayre. R. E. Boswell, trainmaster at Big Springs, Tex., has been appointed superintendent of terminals, with office at Fort Worth, Tex., succeeding S. E. Carnahan, appointed general yardmaster at Fort Worth.

F. M. Smith, whose appointment as superintendent of the Lake Shore & Michigan Southern, with office at Chicago, has been announced in these columns, was born at Dorset, Ohio. He received a high school education and began railway work with the Lake Shore & Michigan Southern on November 14, 1886. He was telegraph operator on the Franklin division of the Lake Shore for seven years and for almost five years division claim agent. For five years, from January 1, 1898, he was claim agent on the western division, with office at Chicago, and during 1903 and 1904 was trainmaster of the Indiana, Illinois & Iowa, now the Chicago, Indiana & Southern, at Kankakee, Ill. Early in 1905 he was transferred to the western division, where he remained three months, and he was then for seven months trainmaster on the Michigan division. Mr. Smith was appointed assistant superintendent of the western division, with office at Chicago, in November of the same year, from which position he was promoted as above on December 1.

Traffic Officers.

A. S. Wagner, passenger and ticket agent of the Missouri, Kansas & Texas at Houston, Tex., has been appointed district passenger agent of the Texas & Pacific, with office at El Paso, Tex.

W. W. Richardson, assistant general passenger agent of the Pennsylvania Lines West at Pittsburgh, Pa., has been appointed general passenger agent of the Southwest System, with office at Pittsburgh.

Frederick S. Holbrook, chairman of the Official Classification Committee at New York City, has been appointed general traffic manager of Wells Fargo & Co., with office at New York, effective January 1, 1912.

J. P. Anderson has been appointed contracting freight agent of the Missouri, Kansas & Texas, with headquarters at Fort Worth, Tex., succeeding F. S. Fisher, resigned to accept service with another company.

The office of auditor of the Cincinnati, Lebanon & Northern having been abolished, effective January 1, Clay Rockwell, auditor and general passenger and freight agent, will hereafter devote all of his time to traffic matters.

J. M. Mauden, city ticket agent of the Toledo, St. Louis & Western and the Chicago & Alton at St. Louis, Mo., has been appointed traveling passenger agent, with office at St. Louis, and George V. Cardner succeeds Mr. Mauden.

R. C. Melvin has been appointed traveling freight agent of the Texas & Pacific, with office at San Francisco, Cal., reporting to the Pacific Coast traffic agent at Los Angeles, Cal. He succeeds W. J. Lane, resigned to accept service with another company.

G. W. Lewis has been appointed freight soliciting agent of the Southern Railway, with office at Huntsville, Ala., succeeding T. C. Sanford, resigned. W. R. Wyatt has been appointed freight soliciting agent at Mobile, and J. A. Lechler has been appointed freight soliciting agent at Atlanta, Ga.

R. C. Gentry, city passenger and ticket agent of the St. Louis & San Francisco at Fort Smith, Ark., has been appointed traveling passenger agent, with office at Pittsburgh, Pa. O. B. Lozier, traveling passenger agent at Chicago, has been transferred to the territory formerly in charge of W. H. Oram, also with office at Chicago, who has resigned. C. G. Jump succeeds Mr. Lozier, with office at Chicago.

J. W. Piatt, traveling freight agent of the Cincinnati, New Orleans & Texas Pacific and the Alabama Great Southern at Cincinnati, Ohio, has been appointed traveling freight agent, with office at Cincinnati, of the Queen & Crescent Despatch, which operates over those roads,; the Alabama & Vicksburg, the New Orleans & Northeastern, the Vicksburg, Shreveport & Pacific and the St. Louis-Louisville lines of the Southern Railway. L. E. Banta, traveling freight agent of the C. N. O. & T. P. at Indianapolis, Ind., has been appointed traveling freight agent of the Queen & Crescent Despatch, with office at Louisville, Ky., and W. E. Hurley, traveling freight agent at Jacksonville, Fla., has been appointed traveling freight agent, with office at Cleveland, Ohio. All three men will report to E. Schryver, manager of the Queen & Crescent Despatch at Cincinnati.

Engineering and Rolling Stock Officers.

W. F. Muff, roadmaster of the Middle division of the Atchison, Topeka & Santa Fe, with office at Newton, Kan., has resigned to engage in other business.

J. A. Zehner, division engineer of the Lehigh Valley at Wilkesbarre, Pa., has been appointed division engineer with office at Hazleton, succeeding M. H. Elkin, deceased. F. N. Loughnan, supervisor at Wilkesbarre, succeeds Mr. Zehner.

H. E. Brashares, signal supervisor of the Chicago & Western Indiana, has been appointed inspector of signals of the Great Northern, with office at St. Paul, Minn., succeeding C. R. Hodgdon, appointed signal engineer of the Canadian Pacific.

M. J. Brundage, formerly with the signal department of the Chicago, Rock Island & Pacific, has been appointed signal supervisor of the Chicago & Western Indiana, with headquarters at Chicago, succeeding to H. E. Brashares, resigned to go to the Great Northern.

Burt Anderson has been appointed assistant signal engineer of the Atchison, Topeka & Santa Fe, with office at Topeka, Kan. Edgar Winans has been appointed signal supervisor of the Coast lines, with office at Los Angeles, Cal., succeeding P. B. Hyde, resigned to accept service with another company.

T. A. Palmer, roadmaster of the Chicago, Rock Island & Pacific at El Dorado, Ark., has been appointed roadmaster between mile post 97 and El Dorado on sub-division No. 53, between El Dorado and Winnfield, La., on sub-division No. 54, and between Winnfield and Packton, La., on sub-division No. 55, with office at El Dorado, succeeding George Woods, transferred. S. J. Rufer has been appointed roadmaster between Haskell, Ark., and mile post 97 on sub-division No. 53, and between Tinsman, Ark., and Crossett, sub-division A, succeeding Mr. Palmer.

M. M. Cooke, assistant engineer of the Wichita Falls Route, has been appointed chief engineer of the Wichita Falls & Northwestern of Texas, the Wichita Falls & Northwestern and the Wichita Falls & Southern, with office at Wichita Falls, Tex. Mr. Cooke began railway work in the engineering department of the St. Louis Southwestern in 1902 as a rodman and later was instrument man and draftsman on that road. From 1907 to 1909, he was draftsman and instrument man on the Panama canal, and since that time has been assistant engineer of the Wichita Falls route.

Henry Smith Elliott, whose appointment as division engineer of the Erie Railroad, with office at Hornell, N. Y., has been announced in these columns, was born July 26, 1879, at Albany. He was educated in the Rensselaer Polytechnic Institute, graduating in the class of 1900. The same year he entered the service of the Albany & Hudson Railway & Power Company. The following January he went to the Erie Railroad as a rodman, and in February, 1902, he was appointed assistant engineer, which position he held about two years. He was then made supervisor, and from September, 1907, until March of the following year, was in charge of construction work, and was then appointed assistant supervisor of terminals. On February 1, 1910, he was appointed assistant engineer of the New York division and terminals, and in March, 1911, was appointed assistant engineer in the office of the engineer of maintenance of way, which position he held at the time of his recent appointment as division engineer.

Purchasing Officers.

J. Q. Lalor has been appointed division storekeeper of the Union Pacific, with office at Denver, Colo., succeeding George Wheadon, resigned.

J. T. Andrus, purchasing agent of the Oregon-Washington Railroad & Navigation Company at Spokane, Wash., having resigned and his position having been discontinued, the purchases for that division are made by R. Koehler, general purchasing agent, with office at Portland, Ore.

OBITUARY.

Frank Edward Snow, general passenger agent of the Canada Southern before that road was absorbed by the Michigan Central, died at Detroit, Mich., on December 11.

Edward W. Cover, superintendent of the Southern Missouri & Arkansas from January, 1897, until February, 1902, when that road was taken over by the St. Louis & San Francisco, died at the home of his daughter at Cape Girardeau, Mo., on December 3. Mr. Cover was born December 12, 1852, and began railway work in 1883 as joint agent for the St. Louis Coal Railroad, and the St. Louis, Alton & Terre Haute, now the Illinois Central, at Pinckeyville, Ill. For several years since 1902 he was agent of the Frisco at Campbell, Mo.

Edward Preble Wilson, formerly general passenger agent of the Cincinnati, New Orleans & Texas Pacific, died at Hamilton, Ohio, on December 7. Mr. Wilson was born at Washington, Pa., in 1838, and graduated from Washington College in 1859. In October, 1863, he entered the freight department of the Louisville & Nashville, and from that time until July 1890, was continuously in railway service. He held various positions in the freight and passenger departments, and from 1877 to 1885 was with the Cincinnati Southern and its successor, the Cincinnati, New Orleans & Texas Pacific, first as general superintendent and general passenger agent, then as general freight and passenger agent, and later as general passenger agent. He was arbitrator of the Chicago, St. Louis & Missouri River Passenger Association from 1885 to 1886, then for three months commissioner of the Southwestern and Northwestern Passenger Associations, and for four years, from October, 1886, was general passenger agent of the Chicago & North Western. In July, 1890, he became commissioner of the Cincinnati freight bureau, which position he held until 1898. From the latter year until his retirement from business he was connected with a number of commercial organizations and transportation clubs in the vicinity of Cincinnati.

Richard N. Durborow, general superintendent of motive power of the Pennsylvania Lines east of Pittsburgh, Pa., and Erie, with office at Altoona, died of heart disease at Philadelphia on December 9. Mr. Durborow was born in Philadelphia on April 10, 1860, and was educated at Cheltenham Academy and Maryland Military Institute. He entered the service of the Pennsylvania Railroad in February, 1879, as an apprentice in the West Philadelphia machine shops. In September of the following year he was transferred to Altoona, and upon the completion of his apprenticeship he entered the mechanical engineer's department at Altoona. In March, 1890, he was appointed inspector in the West Philadelphia car shops, and in October, 1892, he was made assistant general foreman of the same shops. He was promoted to acting master mechanic in November, 1895, and the following March became master mechanic at the West Philadelphia shops. On May 15, 1900, he was promoted to superintendent of motive power of the Philadelphia, Baltimore & Washington, and the following August was made superintendent of motive power of the Buffalo & Allegheny Valley division. In October, 1901, he was appointed superintendent of motive power at Altoona, and since June 28, 1911, was general superintendent of motive power at Altoona. Out of respect to the memory of Mr. Durborow, all the shops of the Pennsylvania Railroad in Altoona, as well as a number of business houses, were closed December 11, the day of his funeral.

R. N. Durborow

Equipment and Supplies.

LOCOMOTIVE BUILDING.

THE DURHAM & SOUTH CAROLINA has ordered 1 ten-wheel locomotive from the Baldwin Locomotive Works.

THE KANAWHA, GLEN JEAN & EASTERN has ordered 1 mikado locomotive from the Baldwin Locomotive Works.

THE MISSOURI, OKLAHOMA & GULF has ordered 2 consolidation locomotives from the Baldwin Locomotive Works.

THE CHICAGO & NORTH WESTERN is said to have ordered 15 switching locomotives, 15 passenger locomotives and 45 freight locomotives from the American Locomotive Company. This item has not been confirmed.

CAR BUILDING.

THE CHESAPEAKE & OHIO is making inquiries for 200 freight cars.

THE CHICAGO, ROCK ISLAND & PACIFIC is in the market for 15 cabooses.

THE BUFFALO, ROCHESTER & PITTSBURGH is in the market for 100 flat cars.

THE CANADIAN PACIFIC has ordered 90 oil tank cars from the American Car & Foundry Company.

THE DELAWARE, LACKAWANNA & WESTERN is in the market for 200 steel hopper cars and 200 refrigerator cars.

THE HARRIMAN LINES have ordered 65 all steel combination baggage and postal cars from the Pullman Company.

THE ELGIN, JOLIET & EASTERN is said to be in the market for 700 all-steel dump cars. This item has not been confirmed.

THE SAN DIEGO & CUYAMACA is figuring on 3 coaches, 1 combination baggage, mail and passenger car, and 1 baggage car.

THE MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE is said to be in the market for 300 refrigerator and vegetable cars. This item has not been confirmed.

THE WESTERN LIVE STOCK EXPRESS COMPANY, Chicago, is not in the market for refrigerator cars as was mentioned in the *Railway Age Gazette* of December 8.

THE NASHVILLE, CHATTANOOGA & ST. LOUIS is said to have ordered 200 box cars from the American Car & Foundry Company. This item has not been confirmed.

THE INTERCOLONIAL has ordered 52 box cars from the Canadian Car & Foundry Company, 5 passenger cars from the Preston Car & Coach Company, and 9 box cars from the company's shops.

THE CHICAGO, BURLINGTON & QUINCY has placed an order with the Crawford Locomotive & Car Company for 500 steel center sill constructions, to be applied as reinforcements to old equipment in its railway shops.

THE CHICAGO & NORTH WESTERN is said to have ordered 600 automobile cars from the Western Steel Car & Foundry Company, and 500 flat cars from the Standard Steel Car Company. These cars are said to be in addition to those mentioned in the *Railway Age Gazette* of December 8. This item has not been confirmed.

IRON AND STEEL.

THE PENNSYLVANIA has ordered 2,000 tons of bridge steel from the American Bridge Company.

THE CHESAPEAKE & OHIO has ordered 2,500 tons of bridge steel from the American Bridge Company.

THE CHICAGO, BURLINGTON & QUINCY has ordered 500 tons of bridge material from the American Bridge Company.

THE DELAWARE, LACKAWANNA & WESTERN has ordered 700 tons of rails from the Pennsylvania Steel Company.

The Nashville, Chattanooga & St. Louis has ordered 10,000 tons of open hearth rails from the Tennessee Coal, Iron & Railroad Company.

The Northern Pacific has ordered 1,800 tons of bridge steel from the American Bridge Company.

The Boston & Maine has ordered 100 tons of bridge steel from the McClintic-Marshall Construction Company, and is in the market for 150 tons for a bridge at Lynn, Mass.

The Lehigh Valley has ordered 12,000 tons of rails. The Bethlehem Steel Company will roll 8,000; the Pennsylvania Steel Company, 2,000: and the Maryland Steel Company, 2,000.

The Pennsylvania Railroad has issued specifications for 36,000 tons of structural steel for the Hell Gate viaducts, to connect with the approaches to the bridge over the East river, New York.

General Conditions in Steel.—The Steel Corporation has received orders for new business at the rate of over 45,000 tons a day since the first of the month. The improvement, while not sensational, is expected to last several months at least. During the past week several mills which had been idle for months were started up again to fill some orders for early delivery. Prices are showing a tendency to stiffen and there has been an increase during the week of $1 a ton on wire. Orders from the railways have been heavy, especially for bridge material, and it is expected that many large rail orders will be placed very soon within the next few weeks.

SIGNALING.

The Western Pacific will install 75 miles of lower quadrant two-position automatic block signals within the next year between Spring Garden and Oroville, Cal. One electric interlocking plant of 40 levers will also be installed at Sacramento.

The Chicago & Western Indiana is planning to install two drawbridge interlocking plants, one at 126th street in Chicago, where the main line crosses the Calumet river, and the other at the Calumet river bridge on the Dolton branch. These plants will have 12 and 11 levers, respectively.

The Chicago, Indianapolis & Louisville will install 133 miles of three-position, upper quadrant, automatic block signals on its line between Monon, Ind., and Bloomington, Ind. This road is now completing an installation of 161 miles between Hammond and Indianapolis.

The Nashville, Chattanooga & St. Louis will install 20 miles of lower quadrant, three-position automatic block signals between Chattanooga and Shellmound, Tenn., in the near future. Four interlocking plants are under construction at Wauhatchie, Hooker, Whiteside and Shellmound. These machines will represent a total capacity of about 112 levers.

The Cleveland, Cincinnati, Chicago & St. Louis is planning to install 25 miles of automatic block signals during the next year. These will be three-position upper quadrant, and will protect the line between Ivorydale and Middletown, O. This road is also planning to build seven interlocking plants on the Cincinnati division. These will be electro-mechanical plants, and the total number of levers will be about 200.

The Wabash is considering the installation of 58 miles of lower quadrant two-position automatic block signals. The automatic signals now being installed between Staunton and Mount Olive, Ill., will be ready to be put in service January 15. The new work is planned for the lines between Williamsport and Riverside, Delphi and Rockfield, Logansport and Danes, Peru and La Gro, and Shadeland and East Lafayette. Two mechanical interlocking plants of about 10 levers each are to be installed at lap sidings.

The New York, Ontario & Western is planning to install 28 miles of automatic block signals during the next 12 months. On 16 miles of line, between Cadosia and Poyntelle on the Scranton division, disk signals will be put up, and on 12 miles, between Livingston Manor and Cooks Falls, home and distant Style "B" semaphores will be erected. The semaphore signals will be lower quadrant, two-position. This road is also planning to install two mechanical interlocking plants of 56 levers each, one at Scranton and the other at Campbell Hall.

Supply Trade News.

The W. K. Kenly Company, Chicago, will, on January 1, move its main office from the First National Bank building to the Peoples Gas building.

The Falls Hollow Staybolt Company, Cuyahoga Falls, Ohio, has recently installed threading machines in its plant and is now equipped to make individual stays.

George W. Daves, formerly signal engineer of the Chicago & Alton, is now in the sales department of the Edison Storage Battery Company, Orange, N. J., with office at Orange.

Frank R. Coates, recently a vice president of the Inter Ocean Steel Company, Chicago, and formerly chief engineer of the Chicago Great Western, has been made president of the Toledo Railways & Light Company, succeeding A. E. Lang, resigned.

William H. McIntyre, president of the San Antonio & Aransas Pass and formerly fourth vice-president of the Equitable Life Insurance Company, New York, has been made first vice-president and general manager of Manning, Maxwell & Moore, New York, a newly created position. Mr. McIntyre retains his position as president of the San Antonio & Aransas Pass.

The Baldwin Locomotive Works, Philadelphia, Pa., has recently acquired the right to build the Garrett type locomotives for service in the United States and Canada. The special feature of these locomotives is that they are of high capacity and will operate on lines having sharp curves. They were described in the *Railway Age Gazette* of November 12, 1909, page 917.

The Allith-Prouty Company, Albion, Mich., which on April 1 last succeeded to the business of the Allith Manufacturing Company, Chicago, and the T. C. Prouty Company, Albion, has moved its general offices and also the Chicago and Albion factories, to Danville, Ill., where it has recently erected and equipped a $50,000 building for the manufacture of door hangers, floor hinges and hardware specialties.

The Carborundum Company, Niagara Falls, N. Y., has been awarded the grand prize for the exhibit of abrasive materials at the Turin Exposition, Turin, Italy. American manufacturers of many products were represented at the exposition, which was held from April 15 to October 31 of this year. The Carborundum exhibit showed a complete line of Carborundum wheels, Aloxite wheels, Carborundum dental wheels, Carborundum sharpening stones and razor hones.

The Supreme Court of the District of Columbia has rendered a decision sustaining the claims of Peter H. Murphy, president of the Standard Railway Equipment Company, St. Louis, Mo., against the Baltimore & Ohio, for infringement of the Murphy patents covering the Murphy outside metal car roof. The decree declares the Murphy patents to be valid and to have been infringed by the roof used by the Baltimore & Ohio. A permanent injunction was issued prohibiting the railway company from further use of this roof, except those already applied, pending an appeal to a higher court. The question of the amount of damages to be assessed was referred to the auditor of the court.

The annual report of the Canadian Car & Foundry Company, Montreal, Can., for the year ended September 30, 1911, shows that real estate, buildings, machinery, patents and good will are valued at $10,147,297. The total issue of preferred and common stock of the Canadian Steel Foundries, entered at cost, is $1,350,000; manufactured product, materials and supplies, at or below cost, $2,505,609; accounts receivable, $2,102,294; cash in banks and on hand, $198,081; total current assets, $5,217,700. Of the 7 per cent. cumulative preferred stock, $7,500,000 is authorized and $5,000,000 is outstanding. Part consideration for purchase of capital stock of the Canadian Steel Foundries was $1,100,000. Of the common stock, $5,000,000 is authorized and $3,875,000 is outstanding. Of the first mortgage 30-year 6 per cent. sinking fund gold bonds due 1939, $7,500,000 are authorized and $3,500,000 are outstanding. Total current liabilities are $1,784,711. The balance on September 30, 1910, was $404,197, after 2 per cent. dividends had been paid on the common stock. Profits for the year were $1,007,138. Dividends of 7 per cent. on the preferred stock were $385,000. The surplus for the year was $632,138.

Gross sales for the year were over $12,500,000, a considerable increase over the gross sales of the previous year, but the serious trade depression in the United States necessitated a reduction in the percentage of profit on the sales. Notwithstanding the greater volume of business transacted, the inventories and accounts receivable remained at substantially the same figures as in the previous report. At the close of the fiscal year the unfilled orders on the company's books were, roughly, $5,000,000, but by the middle of November they had increased to about $10,000,000. Extensions were authorized to the passenger car departments at Amherst, N. S., and Turcot, Montreal; a new steel freight car department for the Turcot works; an addition to the steel car plant at the Dominion works, Halifax, N. S., and an extension to the malleable iron foundry at Amherst were also authorized. These improvements are now all under way, and steel underframe cars are being built at the Turcot works. The total cost of the improvements will be about $350,000. Shortly after the first of the year the Canadian Steel Foundries, Montreal, was formed to take over the properties of the Montreal Steel Works and the Ontario Iron & Steel Company, Welland, Ont., to furnish facilities for the production of steel castings. For this purpose $3,650,000 6 per cent. first mortgage and collateral trust bonds were issued, the principal and interest being guaranteed by the Canadian Car & Foundry Company. Of this issue, $750,000 was set aside to redeem a previous issue of bonds, of the same amount, of the Montreal Steel Works. All of the issued capital stock of the Canadian Steel Foundries, or $1,400,000 preferred and $3,000,000 common, is owned by the Canadian Car & Foundry Company. It was found advisable to make extensive improvements at the Welland plant, and the new plant at Montreal will not be completed and ready for operation until next spring.

TRADE PUBLICATIONS.

AIR HOSE.—Guilford S. Wood, Chicago, has issued an original mailing folder illustrating the elasticity of the rubber used in Honesthose for pneumatic and air hoist hose.

ROCK DRILLS.—The Ingersoll-Rand Company, New York, has devoted form No. 4003 to Little Giant rock drills. These drills are designed so as to give the necessary valve travel with a very short piston stroke, and for this reason they have a very wide range of effective stroke. The drills are described in detail and illustrations, diagrams and tables are given. The booklet also includes a full list of parts with numbers for ordering, and illustrations of each separate part.

CONDENSERS.—The Wheeler Condenser & Engineering Company, Carteret, N. J., has published bulletin No. 107 on high vacuum jet condensers. Special attention is devoted to the Wheeler rectangular jet condenser, which is constructed on the counter-current principle. Tables are included showing a high percentage of efficiency. One chapter discusses air removal from jet condensers and the value of cold air pump suction. Wheeler barometric ejector condensers and Wheeler direct-acting jet condensers are also illustrated and described.

SAN PEDRO, LOS ANGELES & SALT LAKE.—The passenger department of this company has issued an attractive booklet describing the reconstruction of the line through the Meadow Valley wash in southeastern Nevada, for the purpose of locating the tracks on a higher level out of the reach of floods. The work involved the reconstruction of 76 miles of track through the gorge, and the entire work was completed in thirteen months. The work included the building of 10 tunnels of a total length of 5,972 ft., and 24 bridges of a length of 4,925 ft. Of the 85 crossings of the stream on the original line 61 are avoided by the new high line. The booklet includes many excellent illustrations showing the old line and the new higher level track.

With the completion of the railway from Orsono, in southern Chile, south to Puerto Montt, another important link was forged in the chain of railways which it is planned to extend from the southern to the northernmost point in the republic. The completion of this line enables freight and passengers to be transported from Puerto Montt direct to Valparaiso, in the northern part of Chile.

Railway Construction.

New Incorporations, Surveys, Etc.

ALGOMA CENTRAL & HUDSON BAY.—The Soo division has been extended from Pangissin, Ont., north to Batchewana, 11 miles. R. S. McCormick, chief engineer, Sault Ste. Marie.

BATESVILLE SOUTHWESTERN.—An officer writes that an extension has been projected from Yocona, Miss., to Charleston, 11 miles. R. J. Darnell, lessee, Memphis, Tenn. (November 24, p. 1079.)

BIG SANDY & CUMBERLAND.—This line has been extended from Matney, Va., to Rife, two miles. G. W. Litz, general manager, Hurley.

BISMARCK, BELLEVUE & WESTERN.—An officer writes that the line has been located from Bismarck, Mo., west to Sunlight, 20 miles. H. Rohwer, chief engineer, 700 Fullerton building, St. Louis. (June 9, p. 1333.)

BRINSON RAILWAY.—An officer writes that preliminary surveys have been made for an extension from Waynesboro, Ga., to Athens, 105 miles. S. T. Grimshaw, chief engineer, Springfield.

BUFFALO, BATAVIA & ROCHESTER (Electric).—The New York Public Service Commission, Second district, has received a petition for a proposed new electric railway between the cities of Buffalo, N. Y., and Rochester. The proposition involves the consolidation of the Buffalo & Williamsville, the Buffalo & Depew and the Buffalo, Genesee & Rochester, under the name of the Buffalo, Batavia & Rochester. The Buffalo & Depew now runs from Buffalo to Depew, and the Buffalo & Williamsville extends from Buffalo to the easterly bounds of the village of Williamsville, Erie county. The Buffalo, Batavia & Rochester and the Buffalo, Genesee & Rochester hold certificates of public convenience and necessity to build between Buffalo and Rochester. The Buffalo, Batavia & Rochester also has franchises from all the towns and villages through which the proposed line will pass, with the exception of the towns of Pembrook and Churchville, which franchises have expired. The new company proposes to build an extension of the Buffalo & Williamsville, which in connection with the proposed line of the Buffalo, Genesee & Rochester will form a continuation of the Buffalo & Depew. These proposed routes join near the village of Batavia, and will form one continuous connected line of railway. Arrangements have been made with the Batavia & Genesee Construction Company to enter into a contract to build and equip the railway from Buffalo to Rochester.

BUFFALO & DEPEW.—See Buffalo, Batavia & Rochester.

BUFFALO, GENESEE & ROCHESTER.—See Buffalo, Batavia & Rochester.

BUFFALO & WILLIAMSVILLE.—See Buffalo, Batavia & Rochester.

BUTTE, BOISE & SAN FRANCISCO.—This company, which was organized in Montana with $25,000,000 capital, to build from Butte, southwest through Montana, Idaho, Oregon and California, to San Francisco, it is understood, is letting contracts and construction work will probably be started in April, 1912. An advisory board, of which Dr. W. H. Haviland is a member, will have its headquarters at Butte, Mont. (November 3, p. 930.)

CARY NORTH & SOUTH.—An officer writes that surveys are being made from Cochran, Ga., to Milledgeville, 64 miles. D. B. Dunn, chief engineer, Macon. (May 12, p. 1132.)

CENTRAL RAILROAD OF OREGON.—The Hot Lake branch has been opened for business from Union, Ore., west to Hot Lake, eight miles. R. H. England, vice-president and general manager, Union.

CENTRAL VERMONT.—An officer writes that this company proposes to start work early next year on the following lines, for which surveys have been completed: Southern New England Railroad from Palmer, Mass., to the Massachusetts-Rhode Island state line, 41 miles; Southern New England Railway, from the Massachusetts-Rhode Island state line to Providence, R. I., about 30 miles, and the Southern Vermont, from Windsor, Vt., to Brattleboro, about 50 miles. G. C. Jones, general manager, St. Albans.

Charlotte Harbor & Northern.—A branch has been opened for business between Cottman, Fla., and Tiger Bay, 25 miles. G. S. Bruce, chief engineer, Boca Grande.

Chicago, Memphis & Gulf.—An officer writes that this company has projected an extension from Hickman, Ky., northeast to Clinton, 16 miles. S. G. Latta, president and general manager, Dyersburg, Tenn.

Chicago, Milwaukee & Puget Sound.—An officer writes that work is now under way by Caughren, Boynton & Co., Spokane, Wash., building the Idaho & Western from Atlas, Idaho, to Coeur d'Alene, 3.9 miles. E. O. Reeder, chief engineer, Seattle, Wash. (November 17, p. 1036.)

Announcement has been made that work is to be started at once extending the branch line from Lewiston, Mont., northeast to Roy, about 35 miles. The estimated cost of the work is $3,500,000. E. O. Reeder, chief engineer, Seattle, Wash.

Chicago & North Western.—See an item regarding opening of new line of this company under Traffic News.

Clear Lake Railway.—An officer writes that the plans call for building from Hopland, Mendocino county, Cal., on the main line of the Northwestern Pacific east, thence north to Lakeport, on the west side of Clear lake, 24.2 miles. When this work is completed a branch is to be built east to Kelseyville, three miles, and an extension is also to be built from Lakeport north to Upper Lake, 10 miles. Steamer service around Clear lake is also contemplated. A grading contract for a 6.5-mile section east from Hopland has been let to Elliot & Axman, with temporary headquarters at Hopland. C. M. Hammond, president, Upper Lake. (November 17, p. 1036.)

Crystal City & Uvalde.—The Gardendale-Fowlerton division has been opened for business from Gardendale, Tex., to Fowlerton, 26 miles. E. Breaker, chief engineer, Crystal City.

Decatur Pana & Southern.—Incorporated in Illinois, with office at Decatur, to build from Decatur, Ill., south to Pana, about 40 miles. The incorporators include H. S. Ashcraft, H. G. Hodgkins, J. W. Larkott and J. Martin, all of Chicago.

El Paso & Southwestern.—An officer writes that work is now under way on an extension from Fairbanks, Ariz., to Tucson, 66.88 miles. MacArthur Bros. Co., Chicago, are the contractors. Work is also under way rebuilding a section of the old line on an entirely new location between Lewis Springs, Ariz., and Fairbanks, 10.53 miles. Lee Moor, Fairbanks, is the contractor. J. L. Campbell, engineer maintenance way, El Paso, Tex.

Gainesville Midland.—See Georgia Roads.

Georgia Roads.—A preliminary reconnoisance has been made for a line from Athens, Ga., via Smithsonia, Lexington and Sandy Cross to Washington. G. J. Baldwin, Savannah, president of the Gainesville Midland is interested.

Goldsboro, Seven Springs & Swansboro.—Incorporated in North Carolina with $1,500,000 capital, to build from Goldsboro, N. C., to Swansboro, 70 miles. The incorporators include R. C. Griffin and William A. Robertson.

Great Northern.—An officer writes that work is now under way on the following lines: Fargo, N. D., to Surrey, 2.10 miles; Vaughn, Mont., to Augusta, 40 miles; Bluestem, Wash., to Klaxta, 39 miles. A. H. Hogeland, chief engineer, St. Paul, Minn.

Hampden Railroad.—According to press reports a contract has been given to C. W. Blakeslee & Son, New Haven, Conn., to build a 6.5 mile section on the eastern end of this line. The company was organized to build from Springfield, Mass., to Bondsville, 20 miles. R. D. Gillett, president, Westfield. (June 9, p. 1334.)

Highland Park & Lake Burien (Electric).—Dibble-Hawthorne & Co., Tacoma, Wash., who has the contract to build from Oxbow to Lake Burien, seven miles, has sublet the work as follows: For the grading to McQuade & Moore, for the ties and poles to the A. M. Baum Construction Company, Seattle. W. H. Murphy, president, Seattle. (October 13, p. 734.)

Idaho Northern Railway.—This road has been extended from Emmett, Idaho, to Plaza, five miles. E. H. Dewey, president and general manager, Nampa. (November 24, page 1080.)

Illinois Central.—See an item under General News regarding the proposed terminal improvements to be carried out by this company in Chicago.

Indianapolis, Chicago & Meridian (Electric).—This company is planning to start work at once on a line from Indianapolis, Ind., north to Gary. John Shafer, president, Chicago.

Idaho & Western.—See Chicago, Milwaukee & Puget Sound.

Johnson City Connecting.—Incorporated in Illinois with $5,000 capital, and office at East St. Louis. The plans call for building a railway in Williamson county. The incorporators include: E. J. Pearson and T. L. Phillips, both of St. Louis, Mo.; L. O. Whitnel, H. L. Browning and T. E. Gillespie, all of East St. Louis, Ill.

Kansas City Southern.—An officer writes that work was carried out during 1911 on changes of line to reduce grades on eight sections, aggregating 17.61 miles in Oklahoma from Bunch to Hodgen; also from Bear Creek Junction, Ark., to Neal Springs, 8.54 miles, and from Pickering, La., to Neame, 3.30 miles; a total of 29.45 miles. In addition the grade has been reduced on the present alinement on five sections, a total of 15.3 miles, of which 5.6 miles are in Oklahoma; 1.5 miles in Texas and 8.2 miles in Louisiana. Work is now under way on changes of line to reduce the grades on seven sections between Grandview, Mo., and Neosho, 27 miles. Porter Bros., Seattle, Wash., are the contractors. In addition work is under way reducing the grades on present alinement on 22 sections, aggregating 47.4 miles, of which 32.3 are in Missouri, 3.4 in Arkansas, 0.7 in Texas and 11 in Louisiana. 29.45 miles of new line was built during the year and 21.13 miles of old line removed. C. E. Johnston, chief engineer, Kansas City, Mo. (April 14, p. 925.)

Lexington & Eastern.—See Louisville & Nashville.

Louisville & Nashville.—An officer writes that work is now under way on the Lexington & Eastern from Dumont, Ky., to McRoberts, on about 103 miles. Lane Brothers Co., Alta Vista, Va.; Mason & Hanger, Richmond, Ky.; Jones Bros., Columbus, Ohio; W. J. Oliver, Knoxville, Tenn.; Luck Construction Co., Roanoke, Va., and Winston & Co., Richmond, Va., are the contractors. The company expects to have the grading work finished early in 1912.

Work is now under way on the Wasioto & Black Mountain from Harlan, Ky., up Clover Fork river to Ague, about five miles. This work is being carried out by the company's men. W. H. Courtenay, chief engineer, Louisville, Ky.

Maine Central.—An officer writes that this company has completed relocation work on 6.36 miles from a point east of Cumberland Junction, Me., to a point east of Mill Road. This replaces the 6.80 miles between Cumberland Junction and Gray. T. L. Dunn, chief engineer, Portland.

Nazas Valley & Pacific.—An officer writes that this company has just finished locating the line, and financial arrangements are being made. The plans call for a line from Tepehuanes, Mexico, to Guanacevi, about 62 miles. A branch will probably be built to Inde, 33 miles. J. T. Odell, president, New York. (February 10, p. 301.)

New York Subways.—The New York Public Service Commission, Second district, has given a contract to Patrick McGovern, Boston, Mass., for building section nine of the Lexington avenue subway, between Sixty-seventh and Seventy-ninth streets in the borough of Manhattan.

Oregon Roads.—The Crosset Timber Company, Astoria, Ore., has secured right-of-way, it is said, for building a logging line from Knappa, to the Big Creek district in Clatsop county.

Paragould & Memphis.—An officer writes that this company plans to build an extension between Caldwell, Mo., and Paragould, Ark., 17 miles, and between Manilla and Lepanto, 12 miles. J. W. Vail, president and general manager, Caldwell, Mo.

Paris & Mt. Peeasant.—An officer writes that surveys are being made for an extension from Bogata, Tex., to Mt. Pleasant, 28 miles. H. P. Mobberly, chief engineer, Paris.

Pennsylvania Lines West.—It is understood that work will be started next year on the construction of a low-grade short line branch on the Cleveland & Pittsburgh division between Smiths-

Ferry, Pa., and Bayard, Ohio. Rights-of-way are now being secured.

PORTLAND EUGENE & EASTERN (Electric).—Grading work has been started on the line from Eugene, Ore., to Monroe. A. Welch, manager, Portland. (June 9, p. 1334.)

REDDING & RED BLUFF (Electric).—This company's plans call for a line from Redding, Cal., to Red Bluff, about 35 miles. It is said that the line is to be built as an extension of the Northern Electric and the Vallejo & Northern railways.

RUPERT & NORTHEASTERN.—Incorporated in West Virginia with $5,000 capital and office at Boston, Mass. The plans call for building from Rupert in Greenbrier county, W. Va., to Fenwick in Nicholas county. The incorporators include C. A. Ellis, H. L. Shattuck, S. T. Gano, J. F. Hill and H. L. Higginson, all of Boston.

SACRAMENTO & EASTERN.—Incorporated in California with $1,000,000, to build from Sacramento, Cal., northeast via Fair Oaks and Orange Vale to Folsom, about 20 miles. It has not yet been decided whether steam or electric motor cars will be used for the motive power. The incorporators are connected with the Northern Electric Railway, and include C. P. Hammond, Berkeley; L. J. de Sabla, S. Lilienthal, San Francisco; G. F. Springer, Oakland, and H. W. Furlong, Pleasantville.

SAN FRANCISCO, VALLEJO & NAPA VALLEY (Electric).—The reorganization company now in control of this property, it is understood, will soon commence construction work on an extension from St. Helena, Cal., to Calistoga, about 10 miles. E. Z. Hennessy, vice-president, Napa, Cal.

SOUTHERN NEW ENGLAND.—See Central Vermont.

SOUTHWESTERN TRACTION.—Incorporated in Indiana with a capital of $50,000, and headquarters at Indianapolis, to build from Mooresville, Morgan county, southwest to Sullivan, about 90 miles. The first 20 miles between Mooresville and Eminence will be built next spring. The directors include J. W. O'Hara, J. A. Davidson, J. A. Johnson and F. F. James.

SOUTHERN VERMONT.—See Central Vermont.

TIDEWATER & SOUTHERN (Electric).—An officer writes that this company has finished work on five miles from Turlock, Cal., west toward Modesto, and work is now under way from Stockton to a connection with the line at Turlock, 44 miles. J. H. Wallace, chief engineer, Stockton. (Nov. 24, p. 1081.)

TONOPAH & GOLDFIELD.—It is said that this company will build a three-mile line from Goldfield, Nev., to the Florence Goldfield Mining Company's property. R. W. Cattermole, chief engineer, Goldfield, Nev.

TRINITY VALLEY & NORTHERN.—An officer writes that surveys have been made for building an extension from Lumus, Tex., to Lamb, seven miles. A. J. Wise, chief engineer, Houston, Tex.

TWIN FALLS, ARTESIAN & OAKLEY.—Incorporated with $500,000 capital and headquarters at Twin Falls, Idaho. The plans call for building from Twin Falls southeast via Artesian City to Oakley, about 45 miles, with branches to various places. H. T. West, president.

UNION PACIFIC.—An officer writes that work is now under way by the Phelan-Shirley Company, Omaha, Neb., on an extension from Callaway, Neb., northwest to Gandy, 37.29 miles. R. L. Huntley, chief engineer, Omaha.

UNITAH RAILWAY.—An officer writes that surveys are being made for a change of line from Atchee, Colo., to Sewall, 20 miles. M. W. Cooley, general manager, Mack.

UNITED PROPERTIES (Electric).—This company, which was incorporated at Wilmington, Del., has filed articles of incorporation at Sacramento, Cal., with a capital of $200,000,000. The company operates the Key Route and other electric railways. Plans are being made to build at once from Oakland, Cal., to Sacramento. The incorporators include F. Smith, C. B. Seabrushie, H. R. Ewart, H. W. Davis.

WASIOTO & BLACK MOUNTAIN.—See Louisville & Nashville.

WICHITA FALLS ROUTE.—An officer of the Wichita Falls & Northwestern writes that work is now under way on seven miles north of Woodward, Okla., also on two miles south of Woodward and on a section of 25 miles north of Hammon, the present northern terminus. The grading has been let to small contractors in one, two and three mile sections. M. Westbrook, Aberline, Tex., has the contract for track laying and bridge work on 50 miles, and the remainder of the work is being carried out by the company's men. Maximum grades are ¾ of 1 per cent.; maximum curvature 3 deg. M. M. Cooke, chief engineer, Wichita Falls, Tex.

WICHITA FALLS & NORTHWESTERN.—See Wichita Falls Route.

RAILWAY STRUCTURES.

BUFFALO, N. Y.—The Lehigh Valley's proposition to buy the Hamburgh canal strip in Buffalo for $500,000 and make sundry improvements, including the elevation of its tracks, the elimination of grade crossings and the building of a new passenger station within two years, has been accepted by the board of aldermen.

BRINKLEY, ARK.—The Chicago, Rock Island & Pacific will build a one-story brick passenger station to cost $25,000.

CHICAGO, ILL.—See an item under General News regarding the proposed terminal improvements to be carried out by the Illinois Central in Chicago.

EL PASO, TEXAS.—Work on the reinforced concrete freight house is to be started about January 1, 1912, by the Texas & Pacific at El Paso. The cost of the work is about $75,000.

EUGENE, ORE.—The Oregon Electric has given a contract to the J. McAchem Co., for building bridges over the Willamette and Santiam rivers.

EVERETT, WASH.—The Great Northern is having plans made, it is said, for a reinforced concrete viaduct to be built over its tracks on Broadway.

FT. WILLIAM, ONT.—The Grand Trunk Pacific Railway has awarded a contract to John S. Metcalf Company, Limited, Montreal and Chicago, for the design and construction of a two and a half million bushel concrete storage elevator at the Mission Island terminal.

GREAT RIVER, N. Y.—The New York Public Service Commission, Second district, has ordered the elimination of the grade crossings on the Long Island Railroad known as the Cuttings crossing and the Vanderbilt crossing of the South Country road and the Pond road crossing, situated east of Great River station. Overhead bridges will be provided with a width of 35 ft., and a clearance above the tracks of not less than 21 ft., with a sidewalk on one side of each bridge. The bridges will be constructed of steel and reinforced concrete. The approaches to the bridges are to be 40 feet wide. The Long Island is to prepare the general plans and specifications. The approximate cost of the elimination of the crossings will be $74,000.

LAFAYETTE, LA.—The Southern Pacific is reported as contemplating the construction of a new outside yard with drill track, storage facilities, roundhouse, small machine shop and blacksmith shop.

NEWMAN, GA.—The Atlanta & West Point and the Central of Georgia have awarded the contract for a union station 105 ft. x 160 ft.

OMAHA, NEB.—According to press reports the Chicago, Rock Island & Pacific has bought land in Omaha as a site for a new terminal.

SAN PEDRO, CAL.—The Southern Pacific has applied to the war department for an extension of six months in which to complete the drawbridge now under construction at San Pedro harbor. (Aug. 4, p. 270.)

SPOKANE, WASH.—Bids are being received by the Northern Pacific, it is said, for elevating the tracks in Spokane. It is understood that the company is also planning to put up new shops and a roundhouse.

TALLEQUAH, OKLA.—The St. Louis & San Francisco will build a brick depot with tile roof to cost about $12,000.

YORK, PA.—An officer of the Pennsylvania Railroad writes that authorization has been granted the company to construct a passenger tunnel and an intertrack fence at York.

Railway Financial News.

Atlantic Coast Line.—This company has sold to Brown Brothers, New York, $2,500,000 series B 4½ per cent. equipment trust bonds, maturing semi-annually to 1921.

Canadian Northern.—This company is offering in London $35,000,000 3½ per cent. 50-year debenture bonds at 93. These bonds are guaranteed by the Dominion government.

Canadian Pacific.—The directors have authorized an issue of $18,000,000 additional common stock to be offered to stockholders at 150, each stockholder having the right to subscribe for one share of new stock for every ten shares of stock now held. The last previous issue of common stock was made in October, 1909, when $30,000,000 stock was offered to stockholders at 125.

Central of Georgia.—The two committees representing the first, second and third 5 per cent. income bonds, have made arrangements with the Illinois Central, which controls the Central of Georgia, for the purchase by the I. C. of these bonds at 95 for the first income, 92½ for the second and 90 for the third income bonds. There are outstanding $4,000,000 first income, $7,000,000 second income and $4,000,000 third income bonds, but it is understood that the Illinois Central had already bought all but about $5,000,000 of these bonds before the present arrangements with the two committees. In addition to the price of the bonds, the Illinois Central is to pay interest not so far paid on these bonds. There is about 6 per cent. accrued on the first income, 12 per cent. on the second and 18 per cent. on the third. For a number of years suits have been tried in the courts to compel the Central of Georgia to pay interest on these income bonds.

Chicago & Western Indiana.—The company has sold to J. P. Morgan & Co. $1,800,000 general lien 4 per cent. bonds.

Chicago, Rock Island & Pacific.—The C. R. I. & P. Railway has sold to Speyer & Co., New York, $3,500,000 first and refunding mortgage 4 per cent. bonds, due 1934. The whole issue has been resold to Harris, Forbes & Co.

Cleveland & Pittsburgh.—This company is to issue $1,073,950 stock to reimburse the Pennsylvania Railroad for additions and betterments made under the lease of the C. & P. by the Pennsylvania.

Colorado Short Line.—The Midland Terminal, which is controlled by the Colorado Short Line, has leased the Cripple Creek Short Line, which runs from Colorado Springs to the Cripple Creek mining district.

Cripple Creek Short Line.—See Colorado Short Line.

Detroit, Toledo & Ironton.—January 9 has been fixed as the date of sale of the Detroit, Toledo & Ironton properties covered by the general lien and divisional first mortgage and by the consolidated mortgage.

Illinois Central.—See Central of Georgia.

Joliet & Southern.—It is understood that foreclosure proceedings have been brought against this road, which runs between Joliet and Chicago Heights and Joliet and Aurora.

Lake Shore & Michigan Southern.—See the New York Central and Hudson River.

Missouri Pacific.—The Kansas Utilities Commission has approved of the issue of $3,000,000 Missouri Pacific equipment bonds.

New York Central & Hudson River.—This company has asked permission of the New York Public Service Commission, Second district, to buy the majority stock of the New York, Ontario & Western from the New York, New Haven & Hartford. The New York, New Haven & Hartford owns $2,200 of the total outstanding $4,000 preferred stock, and $29,160,000 common stock of the N. Y., O. & W. out of the total outstanding $58,114,000. The New York Central has agreed to pay $13,108,298, payable in 50-year 4½ per cent. debenture bonds, which would, of course, be issued to the New York, New Haven & Hartford. In 1904 the New York Central had an option on the N. Y. O. & W. stock, but did not exercise it. The New York, Ontario & Western carries about 2,700,000 tons of anthracite coal, which is only about 3½ per cent. of the total tonnage of anthracite coal shipped from the fields.

The New York Central & Hudson River has also asked permission of the commission to buy the outstanding minority stock of the New York & Harlem. The New York & Harlem owns the New York Central main line from the Grand Central station to Chatham, N. Y., and owns a considerable part of the property on which the new Grand Central terminal is being built. The New York & Harlem is leased to the N. Y. C. & H. R. at an annual rental of 10 per cent. on the 26,879 shares of preferred stock and 10 per cent. on the 173,121 shares of common stock (par value of both common and preferred, $50 per share). The New York & Harlem also has $12,000,000 3½ per cent. mortgage bonds outstanding. None of the New York & Harlem stock is now owned by the New York Central & Hudson River, but the railway company asks permission to buy this stock at $350 a $50 share.

The New York Central & Hudson River has sold to the New York, New Haven & Hartford the remaining half of the controlling stock of the Rutland Railroad. The other half of this controlling interest was sold to the New Haven by the N. Y. C. & H. R. in February. (See Feb. 24, p. 370.) It is understood that the price is about $2,500,000, or the same that was paid for the other half of the stock.

This company and the Lake Shore & Michigan Southern have asked the New York Public Service Commission, Second district (state), for the approval of an issue of $15,000,000 4½ per cent. equipment trust certificates of 1912, maturing one-fifteenth annually beginning January 1, 1919. The New York Central Lines ask permission to sell these certificates at not less than 97.

New York & Harlem.—See New York Central & Hudson River.

New York, New Haven & Hartford.—See New York Central & Hudson River.

New York, Ontario & Western.—See New York Central & Hudson River.

Northern Securities Company.—An annual dividend of 3 per cent. has been declared on the company's $3,950,000 stock stubs. This compares with 4 per cent. declared in the latter part of 1910 and 2½ per cent. declared in the latter part of 1909.

Oregon-Washington Railroad & Navigation.—This company has sold $5,000,000 4 per cent. bonds on which bankers had an option.

Placerville & Lake Tahoe.—This property has been ordered sold at public auction on December 27. The road runs from Camino, Cal., to Placerville, eight miles.

Pennsylvania Company.—See a note in regard to the Cleveland, Akron & Cincinnati in General News.

Pennsylvania.—See Cleveland & Pittsburgh.

Rutland.—See New York Central & Hudson River.

St. Lawrence & Adirondack.—An annual dividend of 4 per cent. has been declared on the $1,615,000 stock, all of which is owned by the New York Central & Hudson River. The last dividend paid by the company was 4 per cent. in 1908.

The department of public works of Honduras has received the draft of a contract for the construction of a railway from Puerto Teloa, on the northern coast of Honduras, to Zacate Grande Island on the Gulf of Fonseca. According to the plan, the railway will traverse the entire republic, passing through Tegucigalpa, and branches will extend through the principal towns to the boundaries of Guatemala, Salvador and Nicaragua. The concessionaire agrees to construct at his own expense a wharf provided with lights and guardhouse at each terminal of the line and also to erect custom and warehouses for the account of the state. The concessionaire further agrees to submit to the government a preliminary report and sketch of the railways, as well as a definite drawing of the first 12 miles, repeating this report each four months until the line is completed. Preliminary work must be commenced within a year from date of contract, while the wharves and buildings must be completed within four years.